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Revision of the North American Species of Pseudoleskea*

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(PLATES 7 AND 8)

While it is true that some mosses are so fully differentiated as to fall readily in well-defined species there are others, probably a larger number, that do not behave in this way but appear in groups or series of closely intergrading forms. A satisfactory arrangement of these tries the skill of the systematist to the utmost. If such a group or series be taken as one species a description broad enough to cover the varying forms is generally too indefinite for practical purposes; if species be made of each of the extremes the intermediate forms are but poorly described, and if each of these forms be allowed specific rank nomenclature becomes burdensome to say the least. In general terms and within certain limits it may be stated that the more species made of such a series or group the more unstable are the characters by which they are separated, or supposed to be separated, and the more difficult it becomes to place a given plant. By a careful study however of considerable material it is usually possible to acquire a conception of a central type, which is of value in that it enables the systematist to fix a starting point from which he may gauge the variations.

What constitutes a species is indeed a vexed question, one not likely to be answered soon to the satisfaction of all. It may be safely said however, that a species should represent a fixed point in the evolution of a plant. In other words that it should mean

* The material on which this revision is based was furnished chiefly by Columbia University, the Geological Survey of Canada and Harvard University.

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something, should possess an element of constancy and should not be founded on such variations as originate in the changing conditions by which all plants are more or less influenced. The fashionable tendency to multiply species on the pretext that this is the panacea for all systematic troubles, is not always the outcome of a fuller knowledge on the part of those who make them but often is due either to ignorance of what others have done along the same lines or a desire to appear to know more than their confrères. In the making of species, as with many other things, the better course lies between the extremes and, no matter how often we divide and subdivide our plants, it is quite possible to continue the process along the same lines and for the same reasons until each individual has a specific name of its own.

The members of the genus *Pseudoleskea* are mountain-loving plants which flourish best at high altitudes. When they appear at lower levels they not infrequently show their inability to adapt themselves to their environment by taking on atavistic or depauperate forms. But sparingly collected and then usually without fruit their consideration from a systematic standpoint is somewhat difficult. By an attentive study, however, of considerable material, American and European, it has been possible to acquire a fair conception of the central types that underlie them and to arrange them in accordance with more modern views of nomenclature.

Undesirable as it is in some respects, it becomes necessary to reduce *Lescuraea* to the rank of a subgenus. American plants efface the lines of separation between it and *Pseudoleskea*. The gametophyte characters of *P. radicosa* and *P. rigescens* connect so closely with those of the European *Lescuraeas* as to leave no doubt of their being congeneric. On the other hand the sporophyte characters of *P. radicosa* closely connect with those of *P. atrovirens* while those of *P. rigescens* do the same with the sporophyte characters of *Lescuraea striata*. Indeed, so closely related are these last that Schimper* refers to *P. rigescens* under *Lescuraea* as a "*species Americanae distinctissima*." Sullivant,† however, held that *P. rigescens* (*Leskea rigescens* Wils.) was simply a

* Syn. Musc. Eur. **2**: 621. 1876.

† Ms. Notes on *Pseudoleskea* in Gray herb.

variety, var. *gracilior*, of *P. radicosa* and that this species, "a good *Pseudoleskea*," connected *Pseudoleskea* with *Lescuraea*. As recognized in this Revision the *Pseudoleskeas* constitute an unbroken series more closely related, as they should be, by their sporophyte characters than by their gametophyte.

In this connection it is impossible to make mention of the many favors of which I have been the recipient while engaged in the preparation of this monograph. My grateful acknowledgments however are due Mrs. Britton for invaluable assistance and unnumbered kindnesses and Mr. R. S. Williams for the care with which he has executed the drawings. For valued contributions, types, specimens, notes, my sincere thanks are due Prof. John Macoun, Mr. H. N. Dixon, Mr. Jules Cardot, Dr. B. L. Robinson, Dr. M. A. Howe, M. Eugene Autran, Mr. A. Gepp, Mr. J. B. Leiberg, Rev. A. C. Waghorne, Prof. J. M. Holzinger, Mr. R. S. Williams and Mr. C. E. Faxon.

PSEUDOLESKEA Bryol. Eur. **5**: 1852. In part

Plants small to medium size growing on rocks, stones, bases of trees, rarely on rotten wood or the ground, in mountainous regions. Stems radiculose, pinnately branched, central strand none or rudimentary; branches simple, usually recurved at tips; paraphyllia numerous, mostly linear-lanceolate; leaves papillose or smooth, entire or serrulate above, biplicate, ovate-lanceolate, acuminate, costate, margins more or less recurved; leaf cells quadrate-hexagonal to linear-rhomboidal; capsules erect or inclined, straight or curved, pachydermatic, air spaces none, stomata few at base and functionless; exostome well developed, teeth confluent at base into a colored basal band of the same texture; endostominal band $\frac{1}{3}$ to $\frac{1}{6}$ the length of the teeth; segments as long as the teeth; cilia poorly developed; calyptra cucullate.

Braithwaite* and some others reduce *Pseudoleskea* to a subgenus under *Leskea*. This reduction is probably based on insufficient data. The species of *Pseudoleskea* are usually stouter plants, the leaves more strongly recurved on their margins and the areolation longer and narrower. The peristomes moreover show a higher grade of development, the exostomes have a distinct basal band and the exothecial cells are quadrate and thick-walled.

* Brit. Moss. Flora, 3: 9. 1896.

Key to Species

Median cells of stem leaves usually not more than twice as long as wide.
- Leaves papillate on both surfaces. 1. *atrovirens.*
- Leaves smooth or papillate on upper surface.
  - Leaves long-acuminate. 2. *oligoclada.*
  - Leaves acute to short-acuminate. 3. *pallida.*

Median cells of stem leaves usually more than twice as long as wide.
- Stems long, branches few, without radicles. 4. *denudata.*
- Stems short, radiculose, freely branching.
  - Capsule curved when dry, segments oblong-lanceolate. 5. *radicosa.*
  - Capsule straight when dry, segments narrowly linear.
    - Basal cells oblong-quadrate in several rows 6. *rigescens.*
    - Basal cells oblong-linear in two or three rows. 7. *substriata.*

§ EU-PSEUDOLESKEA: Plants rigid, papillose or smooth, median leaf cells not more than twice as long as wide, capsule asymmetric, endostomial band about ⅓ the length of the teeth.

1. PSEUDOLESKEA ATROVIRENS (Dicks.) Bryol. Eur. **5**: 2. *pl. 477.* 1852

Hypnum atrovirens Dickson *fasc. 2.* 10. 1790.

Leskea (?) *patens* Lindb. Soc. pro Fauna at Flora Fenn. 1880.

Pseudoleskea ticinensis Bott. Soc. Tosc. Sc. Nat. 1891.

Pseudoleskea atrovirens, var. *patens* (Lindb.) Hagen in Sched. 1894.

Pseudoleskea heterocladioides Kindb. Rev. Bryol. **22**: 83. 1895.

Pseudoleskea tenella Kindb. Eur. & N. Am. Bry. 50. 1896.

In loosely spreading tufts, dark green above, reddish brown below. Stems 3–5 cm. long, prostrate or prostrate-ascending, radiculose, simple or divided, sparingly branched below, irregularly pinnately above: branches simple, unequal, straight or curved, paraphyllia linear-lanceolate: stem leaves asymmetric, appressed-incurved when dry, erect-spreading on all sides when moist, the lower sometimes spreading-recurved, entire or serrate above; from an ovate or ovate-oblong subdecurrent base gradually acute to somewhat abruptly acuminate, sharply and obliquely pointed, straight or subsecund, margins recurved below, not rarely also at the base of the acumen, lightly biplicate, costate to ¾, .8–1.2 mm. long, .4–.55 mm. wide: cells of stem leaves nearly isodiametric, incrassate, chlorophyllose, unipapillate on both surfaces, papillae central, conic on upper surface, round and flat on lower: median cells quadrate-hexagonal, rarely suborbicular or oblong-hexagonal, .007–.009 mm. wide; also the basal quadrate, in several rows; apical oval-oblong. Dioicous: inner perichetial

bracts whitish, loosely erect, narrowly acuminate, lightly costate: pedicels smooth, reddish brown, somewhat curved, 8–10 mm. long: capsule inclined to horizontal, broadly oval, asymmetric: exothecial cells thick-walled, roundish quadrate: urn 1.5 mm. long, 8 mm. wide, constricted when empty: annulus narrow: exostomial teeth yellowish brown, margined, confluent into a purplish red basal band 5 joints wide: lamellae numerous, well developed: endostomial band yellowish, papillate, ¼–⅓ the length of the teeth; segments as long as the teeth, not rarely slightly open on the keel: cilia one or two, poorly developed: spores rough, .012–.016 mm.; ripe in spring.

Type locality unknown, probably Scotland.

On rocks, rarely on the bases of trees or the ground. From Labrador and Newfoundland (Waghorne) to British Columbia, (Macoun) southward. Mt. Washington, N. H. (C. E. Faxon), Idaho (Lieberg, Sandberg), Montana (Williams), Washington (Röll, Suksdorf), California (Bolander), Greenland ?

EXSIC.: Ren. & Card. Musc. Amer. Sept. 92; Husnot Musc. Gal. 343.

Like all wide-spread species *P. atrovirens* presents a number of forms, none however sufficiently distinct to be regarded as good varieties. Depauperate and diseased plants, in which the normal characters are more or less obscured, are easily referred to the type. One of these, *P. tenella* Kindb., collected on the Labrador, appears at first sight distinct in its nearly branchless stems and smaller leaves, but the leaf-cells and capsules suffice to locate it. On the other hand, stouter plants from the Northwest, with leaves more nearly symmetric, capsules slightly larger, cilia better developed and opercula often short beaked, represent the highest development of the species.

An examination of European material revealed the fact that at least two distinct species were passing as *P. atrovirens*. In order to ascertain which of these had priority, specimens were submitted to Mr. Gepp with a request that they be compared with the type in herb. Dickson in the British Museum. In reply he said, "I am able to tell you that Dickson's type agrees macroscopically and microscopically with No. 1, the leaf-cells in each are quadrate-hexagonal to oval hexagonal, nearly isodiametric, chlorophyllose and stoutly papillose." No. 1, to which Mr. Gepp

refers, was collected by Greville on Ben Lawers. There is therefore no doubt as regards the identity of this species as the leaf-cells are distinctive.

Under *Pseudoleskea*, Limpricht* recognizes but two species, *P. patens* (Lindb.) and *P. atrovirens* (Dicks.), the last with var. *brachyclados* and var. *tenella*. While it is plain that *P. patens* is the same as Dickson's plant, it is not so plain as to what is to be understood by his *P. atrovirens*. Nor do the exsiccatae which he cites help matters much. As these appear in the herb. Jaeger, they but loosely fit the description he gives. In point of fact the exsiccatae belong to a species already referred to as passing for *P. atrovirens* and whose proper name must be ferreted out of the synonyms of this species. It is closely related to *P. oligoclada* Kindb. and is probably *Leskea incurvata* Hedw.

Leskea brachyclados Schwaegr.† usually considered a variety of *P. atrovirens*, has given rise to its share of confusion. Limpricht states that "diese varietat von den Autoren sehr verschieden gedeutet," as it certainly is if reliance can be placed on the type kindly loaned Mrs. Britton by M. Autran from herb. Boissier. This plainly shows that *Leskea brachyclados* is more closely related to *P. radicosa* (Mitt.) than to Dickson's plant, in fact it is scarcely distinct from it. Limpricht's var. *brachyclados* is probably a good species.

2. PSEUDOLESKEA OLIGOCLADA Kindberg, Bull. Torr. Club, **17** : 277. 1890. [Pl. 6]

In rigid spreading tufts, yellow-green to reddish brown, usually with a subvitreous lustre. Stems 3–6 cm. long, prostrate-ascending, sparingly branched, curved at the tips : branches unequal, subjulaceous, recurved : paraphyllia numerous : stem leaves close, 6–8-ranked, appressed when dry, erect speading when moist, falcate-secund, biplicate, margins more or less recurved ; from an oblong-ovate subdecurrent base, somewhat gradually narrowed into a long, serrate or entire acumen, 1.2–1.5 mm. long, .45–.6 mm. wide : costa stout, round, toothed on lower surface, disappearing in the acumen : cells of stem leaves not uniform, rather small and compact, with rounded-obtuse ends ; primordial utricle usually distinct ; median cells smooth on lower surface, lightly unipapil-

* Die Laubmoose, **2** : 805. 1896.

† Schulte. Reise auf den Glockner, **2** : 364. 1804.

late on upper, not rarely smooth on both, oval-rhombic to linear-oblong, .006–.008 mm. wide, 2 to 3 times as long: basal cells quadrate-oblong to sublinear; alar transversely oval, becoming roundish quadrate and extending well up the margins; apical small, oval to oval-oblong: branch leaves falcate, more distinctly serrulate, scarcely plicate. Dioicous: perichetial bracts erect, whitish, long and narrowly subfiliform acuminate, distantly toothed or entire, lightly costate: cells long linear, subvermicular: pedicels 9–11 mm. long, more or less curved: capsule oval-oblong, subsymmetric, cernuous, reddish brown: exothecial cells roundish oblong-quadrate; exostomial teeth reddish brown, confluent at base into a reddish band 5 joints wide: lamellae numerous, stout: endostomial band yellowish, scarcely papillose, about ⅓ the length of the teeth; segments as long but narrower than the teeth, open on the keel: cilia one to two, more or less developed; annulus narrow, indistinct: operculum conic: spores rough, .014–.016 mm.; matures in spring.

Type locality Vancouver Island; duplicate of type in Coll. Can. Geol. Surv.; collected by Prof. John Macoun, June 8, 1887.

On rocks and stones apparently at high altitudes. British Columbia (Macoun), Washington (Röll), Montana (Williams), Idaho (Leiberg), Colorado (Brandegee).

EXSIC.: Macoun, Can. Musc. 610.

P. oligoclada differs from *P. atrovirens* in its leaves being much longer acuminate (acumen longer than body), its polymorphous leaf cells, smooth or lightly papillate on upper surface; from *P. radicosa* in being more rigid, leaf cells smaller and capsule more symmetric. Forms occur with the margins of the leaves less strongly recurved, costa thinner and shorter and median cells somewhat longer; it appears to take on these characters in its advance eastward and southward.

3. **Pseudoleskea pallida** sp. nov. [Pl. 6]

In dense appressed tufts, pale olive green above, rusty brown below. Primary stems defoliate, secondary prostrate-ascending, 2–4 cm. long, often matted together below, sparingly branched above; branches straight or curved at tips, but slightly diverging: paraphyllia few, small: stem leaves asymmetric, deeply concave, biplicate, lightly costate to near apex, straight or subsecund, .7–.9 mm. long, .4–.5 mm. wide; from a roundish ovate base gradually acute to abruptly short-acuminate, acumen somewhat blunt pointed and serrate or narrow and semi-twisted: cells of stem leaves

scarcely papillose, somewhat clear, primordial utricle usually distinct; basal cells rectangular-quadrate; alar quadrate to transversely oval; median rhombic-oval to hexagonal-oblong, .007 .009 mm. wide, about twice as long; apical oval-oblong. Dioicous: perichetial bracts erect, serrulate or entire, inner lightly costate: pedicels curved, 8 mm. long: capsule subsymmetric, oval-oblong, inclined, exothecial cells quadrate-oblong, irregular: urn 1.5 mm. long, .8 mm. wide: exostomial teeth yellowish confluent at base into a reddish basal band 3–4 joints wide: endostomial band pale yellow, ¼ the length of the teeth; segments as long as teeth, slightly open: cilia 2, rudimentary: annulus? operculum? spores rough, .013–.016 mm.

Type locality Colorado; type in coll. of Columbia University; collected by T. S. Brandegee.

Tenderfoot Creek, Belt Mts., Montana. R. S. Williams, Sept. 22, 1890. 4000 ft. altitude.

That there occurs in Colorado and Wyoming, and probably in the adjoining States, a *Pseudoleskea* distinct in its characters from the other species admits of but little doubt. It is, however, difficult to form a conception of its central type by reason of the scantiness and poor quality of the material at hand. It is just possible that the species in question is a derivative from *P. oligoclada*. Specimens collected by Earle & Tracy in southwestern Colorado, and by Elias Nelson in Wyoming, are intermediate between *P. pallida* and var. *filescens* and show a verging toward depauperate forms of *P. oligoclada*.

3a. **Pseudoleskea pallida filescens** var. nov.

Secondary stems filiform, simple, or with a few unequal branches: leaves ovate-lanceolate, gradually contracted to a narrowly acute or obtuse, serrate point, often serrulate above, .3–.4 mm. wide, .6–.8 mm. long: margins more or less recurved: costa shorter, disappearing above the middle: perichetial bracts erect, serrulate above, scarcely costate: capsule unknown.

Colorado; collected by T. S. Brandegee.

Differs from the type in being much more slender, leaves narrower and areolation somewhat longer and narrower, median cells oblong linear, and branch leaves longer acuminate and serrulate

§ RADICOSELLA: Plants rather soft, lightly papillose or smooth, median cells usually more than twice as long as wide, basal cells quadrate to oblong-quadrate in several rows: leaves falcate-secund.

4. **Pseudoleskea denudata** Kindberg, Eur. & N. Am. Bry. **2**: 52. 1896. [Pl. 6]

Pseudoleskea sciuroides, var. *denudata* Kindb. Cat. Can. Plants **6**: 181. 1892.

? *Ptychodium oligocladum* Limpricht, Die Laubmoose, **2**: 801. 1895.

In loose spreading tufts, pale yellow-green above, dirty white below; stems nearly destitute of branches, not radiculose, prostrate (zigzag-undulate), 6–10 cm. long, defoliate below; stems and branches hooked at tips: paraphyllia multiform, mostly long and narrowly linear-lanceolate: lower stem leaves broken, shreddy; upper loosely appressed and suberispate when dry, erect-spreading when moist, concave, more or less falcate-secund, lightly plicate, folds 2–4, margins broadly recurved to apex; from a decurrent base ovate-lanceolate, acuminate, narrowly and obliquely pointed, entire or serrulate above, 1.9–2.2 mm. long, .7–.9 mm. wide: costa narrow, yellowish, subpercurrent: cells of stem leaves yellowish at base, smooth, clear, narrow: median cells sublinear vermicular, .005–.007 mm. wide, 4–6 times as long: basal oblong-rectangular: alar quadrate-oblong: apical linear: branch leaves much smaller, distinctly serrulate above. Dioicous: capsule unknown.

Type locality, British Columbia; duplicate of type in Coll. of the Geol. Surv. of Can., no. 931; collected by Prof. John Macoun on rocks along the Asulcan Creek near a glacier of that name, Selkirk Mountains, alt. 6000 ft., Aug. 7, 1890; Can. Musc. no. 564.

4a. **Pseudoleskea denudata Holzingeri** var. nov.

In its gametophyte characters this differs from the type in its shorter and diffusely branched stems, in its somewhat smaller and more strongly falcate-secund leaves. Perichetial bracts small, thin, broadly ovate-oblong, abruptly and narrowly acuminate, serrulate above, tips spreading-recurved, inner subvaginant, costate: pedicels lightly curved, flattened and twisted above, 10–12 mm. long: capsules broadly oblong-oval, asymmetric, inclined, elongated and strongly contracted when dry and empty: urn 1.5–2 mm. long, 1 mm. wide: exothecial cells quadrate to quadrate-oblong, thick walled: exostomial teeth reddish brown, well developed and strongly lamellate, confluent into a purplish red band 4 joints wide: endostomial band yellowish papillose, ⅓ the length of the teeth: segments as long as teeth, carinate, open:

cilia 1–3, papillose: annulus narrow: operculum short conic: spores rough, .016–.020 mm.: ripens in spring.

On the ground at high altitudes; collected by J. M. Holzinger and J. B. Blake near Lake McDonald, northwestern Mont., July 28, 1898, and by R. S. Williams in fruit near Columbia Falls, Mont., Oct. 10, 1895. A smaller form of what appears to be the same by Dr. Bell at Cape Chudleigh, Hudsons Strait; in Professor Macoun's collection. Bryoth. Mont. no. 343, R. S. Williams.

P. denudata, the largest of our species of *Pseudoleskea*, is easily recognized by its being nearly destitute of branches. It is probable, however, that it will be but rarely found in this form, but that transitional forms will be the more common. Var. *Holzingeri* is distinguished from *P. radicosa* by its larger leaves, longer leaf cells and its freedom from radicles.

5. PSEUDOLESKEA RADICOSA (Mitt.) Lesq. & James. [Pl. 7]

Hypnum radicosum Mitten Jour. Linn. Soc. **8**: 31. 1864.

Hypnum (*Pseudoleskea*) *radicosum* Lesq. & James, N. A. Mosses. 320. 1884.

Macounia sciuroides Kindb. Enum. Bryin. Exot. 1888.

Pseudoleskea sciuroides Kindb. Bull. Torr. Club, **17**: 276. 1890.

Hypnum congestum Wils. Ms.

Hypnum congestum Hook. & Wils. in Drumm. N. A. Mosses, no. 225, in part.

In soft subsericeous tufts, yellow-green to dark green: stems 3–5 cm. long, somewhat densely radiculose, irregularly branched: branches usually recurved, simple: paraphyllia numerous, multiform: stem leaves loosely appressed when dry, spreading when moist, secund, subdecurrent, biplicate, margins narrowly recurved to base of acumen: costa stout, usually toothed, disappearing in the acumen, from an ovate to oval-oblong base gradually or abruptly contracted to a narrow, oblique, serrulate or entire acumen, 1.2–1.6 mm. long, .35–.5 mm. wide: cells of stem leaves somewhat loose, smooth on lower surface, lightly papillose on upper, not rarely smooth on both: primordial utricle usually distinct: basal cells oblong-quadrate, in several rows; medial oval-oblong to linear-rhomboidal, .008–.010 mm. wide, 2–4 times as long: alar cells quadrate; apical linear; branch leaves falcate-secund, serrate. Dioicous: perichetial bracts erect, thin, whitish, finely acuminate,

inner subvaginant, lightly costate: pedicels 9–12 mm. long, curved: capsules oval to obovate-oblong, asymmetric, inclined to subpendant, elongated, contracted and arcuate when dry: urn 1.3–1.9 mm. long, .7–.9 mm. wide: exothecial cells thick-walled, oblong-quadrate: exostomial teeth reddish margined, confluent into a purplish red basal band 5 joints: endostomial band pale yellow, finely papillose, about ¼ the length of the teeth: segments oblong-lanceolate, carinate, somewhat open, as long but narrower than the teeth: cilia rudimentary: annulus narrow, indistinct: operculum conic, rarely short beaked: spores rough, .014–.018 mm.; ripe in spring and early summer.

Type locality, North America.

On rocks, stones, rotten wood, bases of trees and on the ground. From Labrador (Waghorne) and New Hampshire (Allen, Austin, C. E. Faxon) westward to British Columbia (Dawson, Macoun), probably failing in the central region. Idaho (Leiberg), Montana (Williams, Holzinger and Blake), Wyoming (Nelson), Washington (Piper, Röll).

Exsic.: Ren. & Card. Musc. Am. Sept. 93 as *P. rigescens* Lindb.; Macoun, Can. Musc. 627 and 665 as *P. atrovirens* var.

5a. **Pseudoleskea radicosa compacta** var. nov.

In intricate tufts or loose mats, dark green to blackish, branches often with yellow-green tips: stems 2–3 cm. long; branches short, turgid: stem leaves not rarely straight: median leaf cells oval-rhombic to oblong-hexagonal.

In general appearance quite distinct from the ordinary forms of the type but lacking specific charters. On rocks, Rocky Mts., B. C., Professor Macoun.

Mitten based *Hypnum radicosum* on Drumm. Musc. Am. 225, distributed as *Hypnum tenax*. Several sets of these were issued and no. 225 was not the same in all. Some packets contained simply *P. radicosa*, others a mixture of this and *P. rigescens*. As the capsules of the latter were in better condition than those of the former, one was made to supplement the other. Wilson appears to have been the first to discover that there were two distinct species in some of Drummond's 225, one of which he named *Hypnum congestum*, the other *Leskea rigescens*. He failed, however, to publish descriptions of either, and had not Lindberg rescued the latter, both would have been dropped as *nomina nuda*.

In the Sullivant collection are two interesting specimens both of which were sent to Sullivant by Schimper. One of these is *Hypnum radicosum* from Mitten, the other *Leskea rigescens* from Wilson. These are to be regarded as duplicates of the types and are of value in that they serve to fix the meaning of these species.

6. PSEUDOLESKEA RIGESCENS (Wils.) Lindb. Act. Soc. Fenn. **10**: 277. 1872. [Pl. 7]

Leskea rigescens Wils. Ms. Drumm. Musc. Am. 225 in part.

Lescuraea rigescens Bryol. Eur. **5**: 1851.

Hypnum radicosum, var. *gracile* Lesq. & James, N. A. Mosses. 320. 1884.

Pseudoleskea stenophylla Ren. & Card. Bot. Centralbl. **44**: 421. 1890.

Lescuraea imperfecta C. M. & K. Cat. Can. Plants, **6**: 170. 1892.

Lescuraea stenophylla Kindb. Eur. & N. A. Bry. **26**: 1897.

In soft, somewhat silky intricate tufts or mats, pale yellow-green. Stems prostrate, 2–4 cm. long, radiculose, irregularly branched: branches unequal, curved, attenuate: paraphyllia small, linear-lanceolate: stem leaves subcrispate and loose when dry, erect-spreading when moist, straight or subsecund, lanceolate to ovate-lanceolate, gradually long and narrowly acuminate, entire or serrulate above, lightly biplicate, thinly costate, margins plain or revolute below, .8–1.2 mm. long, .25–.35 mm. wide: cells of stem leaves smooth or lightly papillose on upper surface, rarely on both: basal cells quadrate oblong in several rows: alar-quadrate, extending well up the margins; median sublinear-rhomboidal .007–.008 mm. wide, 2–4 times as long; apical oval to oval-oblong or sublinear; branch leaves narrower, serrulate above. Dioicous: perichetial bracts long lanceolate, narrowly acuminate, thin, erect, whitish, inner sub-sheathing, scarcely costate: pedicels erect or slightly curved above, 6–8 mm. long: capsule small, oval-oblong, usually erect, subsymmetric, lightly contracted when dry: urn 1 mm. long, 7 mm. wide: exothecial cells thick-walled, quadrate: exostomial teeth yellow-red, confluent at base into a dark red band 3 joints wide: endostomial band pale yellow, one sixth the length of the teeth or less; segments narrowly linear, as long as the teeth, concave, joints stout, 6–8: cilia none; annulus indistinct or none: spores nearly smooth, .014–.018 mm.; ripe in spring.

Type locality, North America.

On bases of trees or shrubs, more commonly on *Alnus*, and on rotten wood and rocks, in damp places at high altitudes. Montana (Williams), Idaho (Leiberg), Washington (Röll), British Columbia (Macoun).

EXSIC: Macoun, Can. Musc. 580.

P. rigescens is somewhat variable. The stem leaves range from being entire to serrate on the acumen, smooth to lightly papillose on both surfaces, costa thin, disappearing above the middle, to rather stout, sometimes toothed and subpercurrent. These differences are not rarely noted in a single specimen.

From *P. radicosa* it differs in its narrower, and longer acuminate leaves (acumen longer than body), longer vaginule and perichetial bracts, and in its small, suberect capsule with linear segments. The gametophyte characters of depauperate forms of *P. radicosa* are so near the stouter forms of *P. rigescens* that it is sometimes almost impossible to make a satisfactory determination without the sporophyte.

6a. **Pseudoleskea rigescens Howei** var. nov.

Intricate, appressed, pale green silky tufts: stems and branches strongly recurved: stem leaves secund to falcate-secund, serrate at apex, .7–.9 mm. long, .25–.35 mm. wide; margins narrowly recurved: costa stout, disappearing in the acumen: areolation compact; basal and alar cells numerous, quadrate, filling one third of the body of the leaf: capsules not seen.

Collected by Dr. M. A. Howe, Mt. Shasta, Calif., Aug. 5, 1894.

§ LESCURAEA Sch.: Plants soft, leaves usually smooth, median leaf cells long and narrow, extending downward to nearly the line of insertion, capsule symmetric, segments linear, cilia none.

7. **Pseudoleskea substriata** sp. nov. [Pl. 7]

In appressed subshining tufts, yellowish green to golden-brown: stems prostrate, radiculose, 2–4 cm. long, pinnately branched: branches suberect, simple, scarcely curved: paraphyllia few, multiform: stem leaves erect-spreading, straight, deeply biplicate, oval-oblong, gradually acute or acuminate (acumen shorter than body), .8–1 mm. long, .3–.4 mm. wide: margins strongly recurved to nearly apex, serrate above: costa toothed, subpercurrent: stem leaves smooth, clear; basal oblong-linear in 2 or 3 rows: alar quadrate, rugose, thick-walled, filling the space between folds and margins, extending upwards and becoming oblong:

apical linear; median sublinear .006 mm. wide, 4–6 times as long. [Dioicous: perichetial bracts whitish, erect, inner sub-sheathing, finely acuminate, entire or serrulate above, lightly costate: pedicels 7–9 mm. long, straight or nearly so: capsules erect, symmetric, oval-oblong to subcylindric: urn 1.2 mm. long, .6 mm. wide: exothecial cells thick-walled, quadrate-oblong: exostomial teeth yellowish, linear-lanceolate, confluent at base into a reddish band 3 joints wide, scarcely lamellate: endostomial band about $\frac{1}{6}$ the length of the teeth; segments narrowly linear, somewhat shorter than the teeth: cilia none: annulus narrow, indistinct: operculum long conic: spores rough, .013–.016 mm.: from European specimens.]

Type locality, British Columbia; type in Coll. of Geol. Surv. of Canada; collected by Prof. John Macoun on rocks below Hector, Rocky Mts., Aug. 13, 1890. R. S. Williams, rocks on shores of Lake Lindeman, Northwest Territory, May 21, 1898. Sterile.

The basal cells which are oblong-linear in 2 to 3 rows, abruptly passing to the median, readily distinguished *Lescuraea* from the other two subgenera in which the basal cells are quadrate or oblong-quadrate in several rows passing somewhat gradually to the median.

Plants referable to this subgenus are evidently rare in North America. In Europe they are not uncommon, on the higher mountains, often in fruit. Limpricht* recognizes two species, *L. striata* (Schwaegr.) Br. & Sch. and *L. saxicola* (Br. & Sch.) Molendo, which represent the extremes of a series of intergrading forms. Between these are a number of intermediate forms some of which are sufficiently distinct to be recognized as species. *P. substriata* is one of these and differs from *L. striata* in being smaller and in having its smaller leaves shorter acuminate and the acumen more or less sharply serrate. In *L. striata* the leaves are usually entire, long and slenderly acuminate, 1.8 mm. long, .5 mm. wide.

EXCLUDED OR DOUBTFUL SPECIES

Pseudoleskea atricha Kindb. Eur. & N. A. Bry. 53. 1897.

Pseudoleskea atrovireus var. *atricha* Kindb. Cat. Can. Plants, **6**: 180. 1892.

* Die Laubmoose, **2**: 789. 1895.

"Leaves ovate-oblong, short acuminate, cells sublanceolate, conflated, irregularly sinuous; costa not excurrent. Capsule unknown, tufts brownish or olivaceous with green branch tips, loosely cohering, without rhizoids. Branches subjulaceous, irregularly divided; paraphyllia few."—Eur. & N. A. Bry. 53.

Type locality, Griffin Lake, B. C.

Duplicates of the type of this dubious species are in Prof. Macoun's collection, no. 385. As it has been apparently collected but once, and then in a poor condition, without fruit, it would be well perhaps to suspend judgment until more and better material is at hand.

PSEUDOLESKEA FALCICUSPIS C. M. & K. Cat. Can. Plants **6**: 182. 1892

In Prof. Macoun's collection are a few specimens bearing this name, some of which are *P. atrovirens*, the others *P. oligoclada*. The description in Macoun's catalogue, "leaves very papillose" and "cells rotundate" evidently applies to *P. atrovirens;* that in Eur. & N. A. Bry. "leaves faintly papillose and cells oval-oblong" to *P. oligoclada*. As both of these species antedate *P. falcicuspis* it matters little of which it is a synonym so that its true standing be recognized.

Pseudoleskea atrovirens filamentosa Boulay Musc. de la France, **1**: 162. 1884.

According to Barnes & Heald * this variety is found in Montana, Oregon and Washington. As I have seen no specimens of it from these localities I can neither confirm nor deny its occurrence there. From Boulay's description slender forms of *P. oligoclada* might be taken for it and the same is true of *P. denudata Holzingeri*. I am indebted to Mr. H. N. Dixon for a specimen collected and named by M. Boulay. It is a well-marked form of what passes as *P. atrovirens* with European bryologists, but it is entirely distinct from that species. The median cells of var. *filamentosa* closely resemble those of *P. substriata*, but the basal are oblong-quadrate in several rows and the capsule is arcuate.

* Analytic Keys to the Genera and Species of N. A. Mosses, 337. 1897.

Description of Plates

PLATE 6

Pseudoleskea atrovirens.—1. Upper and lower leaves. 2. Outer and inner perichetial leaves. 3. Paraphyllium. 4. Apex of leaf. 5. Median cell. 6. Alar cells. 7. Cross-section.

Pseudoleskea oligoclada.—8. Branch leaves. 9. Stem leaf. 10. Paraphyllium. 11. Apex of leaf. 12. Median cells. 13. Alar cells. 14. Cross-sections of leaf. 15. Capsule.

Pseudoleskea pallida.—16. Stem leaves. 17. Paraphyllium. 18. Apex of leaf. 19. Median cells. 20. Alar cells. 21. Back of apex of leaf, showing rough costa, and papillae on upper surface.

Pseudoleskea denudata.—22. Branch leaves. 23. Stem leaf. 24. Simple and divided paraphyllia. 25. Apex of leaf. 26. Median cells. 27. Alar cells.

PLATE 7

Pseudoleskea radicosa.—1. Branch leaf. 2. Stem leaf. 3. Perichetial leaf. 4. Apex of leaf. 5. Median cells. 6. Alar cells. 7. Cross-section of leaf. 8. Back of costa near apex. 9. Paraphyllium.

Pseudoleskea rigescens.—10. Stem leaves. 11. Perichetial leaf. 12. Paraphyllium. 13. Apex of leaf. 14. Median cells. 15. Alar cells. 16. Cross-section.

Pseudoleskea substriata.—17. Branch leaf. 18. Stem leaves 19. Paraphyllium. 20. Apex of leaf. 21. Median cells. 22. Basal half of leaf. 23. Cross-section. 24. Back of costa near the apex.

Pseudoleskea oligoclada.—25. Capsule with lid. 26. Capsules without lid. 27. Peristome.

Pseudoleskea denudata.—28. Horizontal and arcuate capsules. 29. Peristome.

Pseudoleskea radicosa.—30. Two curved capsules, with and without lid. 31. Peristome with oblong-lanceolate segments.

Pseudoleskea rigescens.—32. Two straight capsules, with and without lid. 33. Peristome with linear segments.

Leaves magnified about 25 diameters; cells and sections magnified up to 260 diameters.

Studies in Sisyrinchium.—VII: The Species of British America

By Eugene P. Bicknell

The examination of our larger collections of blue-eyed grasses has disclosed few specimens from north of the United States other than those contributed by Prof. John Macoun. For this reason it was a matter of the greatest interest to receive recently from Professor Macoun his entire British American collection or, more exactly, some thirty-three sheets representing the general result of many years of field-work covering the wide range of British American territory from Newfoundland to Vancouver. This collection, supplemented by such other material as has been brought together, presents so much that is new, especially in regard to the range of our species, that it has seemed well to make it the subject of a separate paper.

It should be said that the genus *Sisyrinchium* is here taken in a somewhat restricted sense to embrace only the homogeneous and very natural group of the blue-eyed grasses proper, thus excluding *Sisyrinchium grandiflorum* Douglas, which is clearly the type of a distinct genus, as recognized by Rafinesque, and should stand as *Olsynium Douglasii* (A. Dietr.), and omitting further the more closely allied yellow-flowered genus *Hydastylus* Salisbury, typified by *Sisyrinchium Californicum* Aiton.

As thus limited it appears that eight species of *Sisyrinchum* may be ascribed to British America and there is no doubt that this number may be increased. Certain more or less distinct forms of several of the species might, even now, be recognized but are passed over. It is further altogether probable that several northwardly ranging species of the United States cross over into Canadian territory and there is also evidence that new species yet remain to be discriminated.

The species which may be recognized at the present time as British American are the following, noting them from east to west:

S. graminoides Bicknell.
S. angustifolium Miller.
S. albidum Raf.
S. mucronatum Michx.
S. septentrionale Bicknell.
S. Idahoense Bicknell.
S. littorale Greene.
S. Macouni sp. nov.

Of these all but *S. littorale* and *S. Macouni* belong also to the United States, though *S. septentrionale* is all but exclusively British American.

Other species known to occur in states adjoining Canadian territory are the following:

S. Atlanticum Bicknell, Maine (North Berwick, York Co., June 21, 1891, J. C. Parlin, in Herb. Gray, not previously recorded from the state); New Hampshire; Vermont.

S. arenicola Bicknell, Nantucket; New York.

S. hastile Bicknell, Michigan.

S. Farwellii Bicknell, Michigan.

S. strictum Bicknell, Michigan.

S. apiculatum Bicknell, Michigan.

S. campestre Bicknell, Minnesota; North Dakota.

S. occidentale Bicknell, North Dakota; Montana; Idaho.

S. segetum Bicknell, Washington.

S. sarmentosum Suksdorf, Washington.

SISYRINCHIUM GRAMINOIDES Bicknell

This species is of interest as being the only normally branched species occurring north of the United States. Since it there extends northward to central and western New York and throughout the southern peninsula of Michigan its occurrence in the southwestern extremity of Ontario was to be expected, and it is only surprising that a single specimen alone attests its presence there. Elsewhere in Canada the plant was scarcely to be looked for and it is a matter of no little surprise to find it as far north and east as the coast of Gaspe in Quebec and on Newfoundland and Sable Island. These occurrences afford a most unexpected extension of range as the species appears to be unknown elsewhere in Canada east of Ontario nor in New England beyond eastern Massachusetts.

The specimens from Ontario and Gaspe are perfectly typical, while those from Newfoundland and Sable Island show departures from the ordinary plant so considerable as to give them some rank as insular forms. Indeed the Newfoundland plant would scarcely be taken at all for *S. graminoides* and has been distributed as *S. angustifolium* Miller (Robinson's & Schrenck's Flora

of Newfoundland, No. 129) to which species I had myself doubtfully referred it (Bull. Torr. Club, **26**: 339).

A number of sheets of the distribution show the plant to be mostly only 6–10 cm. high, and simple-stemmed with somewhat prolonged outer bract, thus closely simulating *S. angustifolium*. It is, however, clearly a much reduced northern or insular form of *S. graminoides*, drying dark as in that species, and showing the weak and narrow proper stem and relatively broad thin rings with closely serrulate edges, and also its thin-walled sub-globose capsules or spreading pedicels. The leaves are also those of that species, unmistakably so in a few stouter examples where they become 4 mm. wide, although mostly not exceeding 1–1.5 mm.

The tendency of this little plant to develop more clearly the characters of *S. graminoides* is shown by two examples collected with the others which are three to four times taller and forked into two slender branches. These specimens show the extreme form of attenuation seen in the mainland plant and are nearly matched by the specimens from Sable Island, where Professor Macoun reports the plant as common. It is there uniformly very slender, the stems and leaves being but 1–2 mm. wide, and appears to have unusually small capsules, unlike the Newfoundland plant on pedicels scarcely spreading or exserted. It differs further from the latter in larger size (15–30 cm. high) rather broader spathes with less prolonged outer bract and in slenderly branched stem, only a few examples having the stem simple.

In Gaspe and Newfoundland, at the extreme northeastern limit of its habitat, this, the widest-ranging of all our species except *S. angustifolium*, flowers from late in July till the end of August, three to four months later than in the Gulf States, two to three months later than in the South Atlantic States, except at high altitudes, and one to two months later than in the latitude of New Jersey. In northern Michigan the species is equally late flowering. In Ontario it appears to flower about the same time as in central New York, and two or three weeks later than in southern Michigan and New Jersey.

The following specimens may be cited:

SABLE ISLAND: July 22, 1899, in flower; Aug. 4, 1899, immature fruit. John Macoun.

NEWFOUNDLAND: Banks of the Salmonier River, Aug. 26, 1899, B. L. Robinson and H. Schrenck, no. 129, Flora of Newfoundland, nearly mature fruit and some remaining flowers.

QUEBEC: Coast of Gaspe, Aug. 12, 1882, moist meadows, John Macoun; in flower and with young fruit.

ONTARIO: Near Niagara Falls, June 25, 1892, in grassy woods, John Macoun; flowers and young fruit.

SISYRINCHIUM ANGUSTIFOLIUM Miller

This is the most characteristic and generally distributed species of British America, ranging from Newfoundland quite across into British Columbia and north to the Mackenzie River. No eastern specimens have come to hand from farther north than Newfoundland and Riviere du Loup, Quebec. I have elsewhere pointed out that specimens from west of Ontario differ in some rather striking particulars from the more eastern plant, being stiffer and more glaucous with the edges of leaves and stem often quite smooth and with leaves of thicker texture and closer venation and with the primary bract usually more slenderly prolonged. Eastern specimens often show a discoloration on the herbarium sheet in marked contrast with most western examples. It is quite possible that these differences point to two distinct species which a full series of specimens with well-preserved flowers and mature fruit would make it possible to segregate. The western plant itself exhibits a great amount of variation, and certain specimens from Banff, Alberta, appear almost distinct. They are very glaucous and extremely slender and tall, becoming 50 cm. high with the narrow outer bract two to three times the length of the inner one, even becoming 6 cm. long; the slender pedicels become 28 mm. long, and are more than usually exserted; the flowers appear to be rather small and of very delicate texture with an unusual extension of the yellow center along the midvein of the segments.

The species crosses the Rocky mountains into British Columbia, extending further west than I have yet had it from the United States where Madison County, Montana (Rydberg), limits its western record as far as known.

In Newfoundland and Nova Scotia the species comes into flower from late in June till the middle of July, a month to six

weeks later than in the neighborhood of New York, and earlier than *S. graminoides* by about the same length of time. In Ontario it comes into flower during the first half of June, while farther west, from Manitoba to British Columbia, the flowering period seems to be rather earlier, often beginning in the first days of June, or even before. The only example seen from as far north as the Mackenzie River was just in flower July 20th.

The following collections may be cited, all made by Professor Macoun unless not otherwise noted.

NEWFOUNDLAND: June 25, 1896, just in flower; July 12 and 15, 1897, in full flower, Rev. A. C. Waghorne.

NOVA SCOTIA: Louisburg, Cape Breton, July 17, 1883, moist meadows, just in full flower. Amherst Island, low grounds, July 30, 1880, just in flower, Richardson.

PRINCE EDWARD'S ISLAND: Brackley Point, meadows, July 3, 1887, full flower and young fruit; July 7, 1888, just in flower.

NEW BRUNSWICK: Campbellton, July, 1877, boggy meadows, R. Chalmers; St. John's River Valley, Woodstock, July 4, 1899, flowers and young fruit. Baie Vert, June 16, 1893, first flowers; Prof. W. L. Goodwin.

QUEBEC: Riviere du Loup, August 26, 1889, meadows, mature fruit, D. N. St. Cyr; Danville, June, 1894, first flowers, N. K. Berg; Montreal, F. W. Kelly.

ONTARIO: Belleville, June 16, 1876, moist meadows, first flowers; Jones Falls, June 11, 1895, fruit full size, J. Fowler; Nepigion River, July 7, 1884, moist meadows, fruit nearly mature; Toronto Island, June 10, 1893, full flower, C. W. Armstrong; Casselman, June 6, 1891, full flower, dampish ground, Jas. M. Macoun, Lambton, C. K. Dodge.

MANITOBA: Lake Winnipeg Valley, 1857, Bourgeau; Stonewall, June 2, 1896, full flower, amongst rocks, open prairie.

ASSINIBOIA: Moose Mountain Creek, June 6, 1883, first flowers, low ground, Jas. M. Macoun; Park Beg, June 23, 1896, fruit nearly mature, open prairie; Crane Lake, June 16, 1894, full flower, meadows.

SASKATCHEWAN: E. Bourgeau, 1858.

ALBERTA: Banff, July 14, 1891, flowers and young fruit.

BRITISH COLUMBIA: Kitamen River, Kootanie Valley, July

1883, fruit and last flowers, Dawson; Donald, Columbia Valley, July 7, 1885, fruit nearly mature; Lower Arrow Lake, June 4, 1890, first flowers. Latitude 54°, June 15, 1875, first flowers; "The exact locality is on the Machaco River, near Fort St. James, B. C." [J. M.].

MACKENZIE RIVER: Fort Wrigley, July 20, 1892, first flowers, Miss E. Taylor; the most northern point from which any species of the genus has been reported. Prof. Macoun writes: "Fort Wrigley is a new location, about half way between Fort Simpson and Fort Norman, on the right bank of the Mackenzie River, about latitude 63°."

SISYRINCHIUM ALBIDUM Raf.

This species must be admitted to the Canadian flora on the evidence of a single collection made at Sandwich, Ontario, by William Boott as far back as May 26, 1887. The specimens (Gray Herbarium) are in full bloom, thus showing the plant to be the earliest flowering of the British American species. The flowers are pale blue, as in most Michigan examples. Since the species is rather common in parts of southern Michigan, it is not surprising to find that it crosses the Detroit River into Ontario.

I have seen but a single specimen of this species from farther east—Stanley county, North Carolina (W. W. Ashe). Very possibly it may extend farther north and east in Ontario.

SISYRINCHIUM MUCRONATUM Michx.

Like *S. albidum* this species crosses the Detroit River into Ontario, having been collected at Sarnia, Lambton county, by Mr. C. K. Dodge in June, 1897. Specimens from farther north in the Province, Wingham, Huron county, have been distributed by Mr. J. A. Morton, collected in full flower June 5, 1895. Most specimens of this collection are much reduced and have very small pale green spathes and but little exserted pedicels only 10–15 mm. long. Mr. Dodge's specimens from Lambton county, have the spathes deep purple and are closely matched by examples from east Pennsylvania.

A material and most unexpected extension of the known range of the plant is afforded through a collection made at Prince Albert, Saskatchewan, by Professor Macoun, June 29, 1896. The speci-

mens are in full flower and appear to differ in no material way from many Pennsylvania examples, having, however, rather long-bracted green spathes and with some of the pedicels more exserted than is usual and longer, 20–27 mm. in length.

The most northern and western point from which the species has been known hitherto is Port Huron, Michigan (C. K. Dodge).

Certain imperfect specimens of a *Sisyrinchium* from northern Minnesota, which I have elsewhere referred to under *S. angustifolium*, if not a distinct species may represent a stoutly developed form of *S. mucronatum*.

SISYRINCHIUM SEPTENTRIONALE Bicknell

Professor Macoun's collection affords a most interesting confirmation of the validity of this species previously described from only scant material. I am now able to record seven separate collections of the plant, giving it a range from western Manitoba north to Saskatchewan and west to British Columbia and Washington:

MANITOBA: west of Fort Ellice, June 29, 1879, flowers and young fruit, wet prairies, Macoun; east of Pipestone Creek, June 26, 1880, flowers and mature fruit, Macoun.

ASSINIBOIA: Moose Mountain Creek, June 16, 1883, full flower, low ground, Macoun.

SASKATCHEWAN: E. Bourgeau, 1858, Palliser's Brit. N. Am. Exploring Expedition.

ALBERTA: Banff, July 8, 1891, flowers and fruit, village street, Macoun.

BRITISH COLUMBIA: Kicking Horse River, Aug. 13, 1890, mature fruit, low gravelly banks, 4000 ft. alt., Jas. M. Macoun.

WASHINGTON: Wilkes' expedition, 1838–42, Spokane to Colville.

The specimens from Idaho elsewhere doubtfully referred here prove to be not this species.

Professor Macoun writes, "This is certainly a good species and seems to prefer drier situations than any of the others. To be more correct it seems to prefer arid spots where water has lain and dried up. Besides the specimens collected I saw it very frequently between Wood Mountain and the Rocky Mountains over

400 miles from east to west. Its white flowers make it easily seen although it is seldom tall."

The following particulars may now supplement the original description of this plant (Bull. Torr. Club, **26**: 452–3):

Plant becoming 35 cm. high, sometimes merely glaucescent: tufts often very close and narrow: primary bract sometimes 6 cm. long and surpassing the inner one 35 mm.: flowers frequently pure white: perianth 4–8 mm. long, column 3–4 mm. high: capsules obovoid-oblong to subglobose, usually thin-walled and corrugate: seeds very small, about .75 mm. in diameter, obovoid and irregularly angled, black, finely rugulose, becoming smooth or nearly so.

SISYRINCHIUM IDAHOENSE Bicknell

BRITISH COLUMBIA: Agassiz, May 8 and 14, 1889, full flower, meadows, Macoun; Lower Frazier River, 49° N. lat., Dr. Lyall, 1859; Vancouver Island, Victoria, June 10, 1893, full flower, Macoun; Nootka Sound, July, 1896, full flower, Jos. R. Anderson.

"This is the common species west of the Coast Range in British Columbia and on Vancouver Island" [J. M.].

The specimens from Agassiz and the Lower Frazier River are nearest to the Idaho type, but are more slender throughout, and with the leaves and stems smooth-edged or nearly so. The specimens from Nootka Sound are small and still more slender, appearing quite unlike the type, but they are imperfect and can be referred at present only to a reduced northern form. The specimens from Victoria are broader-leaved and more discolored besides having the stem distinctly serrulate. They are closely matched by certain specimens from western Washington and Oregon which are doubtless not the same as *S. Idahoense*, but while these latter differ notably from typical *S. Idahoense* in much stouter roots, the roots of the Vancouver plant are equally slender with those of the other British American specimens.

S. Idahoense is almost certainly an aggregate, but the component forms cannot be understood from present material.

It is worthy of note that the Agassiz plant appears to be earlier-flowering than the plant in Idaho, and also blooms decidedly earlier than does *S. angustifolium* anywhere in British America.

SISYRINCHIUM LITTORALE Greene

VANCOUVER ISLAND: Oak Bay, near Victoria, May 31, 1893, first flowers, Macoun.

The counterpart in appearance of many examples of the Alaskan plant, but apparently somewhat more glaucescent and with the stamineal column longer—7–9 mm. high as against a nearly uniform length of 6 mm. in such Alaskan specimens as have been examined. This difference is a suggestive one and its constancy should be especially noted when the plant is again collected.

"I cannot remember seeing this species anywhere else than at Oak Bay" [J. M.].

The Vancouver plant flowers about one month earlier than the species in Alaska.

Sisyrinchium Macounii sp. nov.

Becoming 50 cm. tall, the narrow grass-like tufts loosely disintegrate-fibrillose at base, the roots slender and nearly simple: pale dull green and glaucescent, somewhat discolored when dry. Leaves long and narrow, mostly 20–30 cm. long, 1.5–3 mm. wide, slenderly very acute, rather thin, the delicate nerves firm and distinct but not crowded, the edges smooth: stem single but sometimes bearing near the top a slender leaf subtending a simple peduncle, very slender, 1–1.5 mm. wide, with very narrow almost membranous margins, the edges smooth or obscurely denticulate-roughened towards the top, transversely constricted just below the spathe: spathes green or slightly purplish along the edges, often or usually abruptly deflected, long and narrow, the bracts thin and not prominently nerved; outer bract slenderly much elongated and tapering acute, 4–7 cm. long, surpassing the inner bract 1.5–4 cm., the extreme edge hyaline below, united-clasping for 4–7 mm. at base; inner bract 23–33 mm. long, tapering and slenderly acute, distinctly hyaline-margined, the keel often sparsely denticulate; interior scales silvery-white, tapering, short, about half the length of the inner bract: flowers large, few, apparently only 2–4, on slenderly exserted subspreading pedicels becoming 35 mm. long, perianth 18–22 mm. long, the emarginate segments very slenderly aristulate, deep purple with a very small yellow eye, the base abruptly broadened from its attachment on the ovary; stamineal-column 8–9 mm. high, anthers 2 mm. long.

"This species was not rare around Comox and was occasion-

ally seen at Nanaimo and on the islands in the Gulf of Georgia" [J. M.].

VANCOUVER ISLAND: Comox, June 21, 1893, meadows, John Macoun.

Named in honor of Professor Macoun.

A handsome species, having the largest and most richly-colored flowers of any simple-stemmed species known to me. It is perhaps most nearly related to *S. segetum*, of Washington, but is much taller and larger, though relatively more slender, and differs notably from this, as well as from the stouter and paler-flowered *S. Idahoense*, in the greatly prolonged outer bract. Two specimens from Vancouver which appear to be reduced forms of this species are smaller flowered than the type with shorter bracts, the outer one much less elongated, and are suggestive of *S. segetum* or slender forms of *S. Idahoense*, although the type is clearly distinct from either. Professor Macoun writes further: "You are quite right in thinking this plant a striking species. Indeed so large were its flowers that I thought it was *S. grandiflorum* when I saw it first."

North American Willows

By W. W. Rowlee

(With Plate 9)

1. LONGIFOLIEAE

This group of species is clearly defined from the other sections of the genus. The presence of two glands in the staminate flower of most of the species and the pale deciduous scales show evident affinity with the pleiandrous willows. The uniform presence of two stamens led Anderson to place them with the diandrous sections. The same characters, however, would place some species of the section Fragiles in the diandrous group. The Longifolieae are evidently closely related genetically to the Fragiles.

The long-leaved willows are confined to North America. None of them are found in the arctic or subarctic regions; two occur in central and western Mexico; the others in the United States and southern Canada. The greatest number of species occur in the western part of the United States, where the great mountain ranges seem to limit to a considerable extent the range of the different species, the consequence being that each has a decidedly north and south range.

Two well-marked types occur in the group, one with smooth pistils, confined to the western part of the continent, the other with more or less hairy pistils found across the continent. In the states of the Pacific coast two distinct types may be recognized by the form of the stigmas, in one *S. argophylla*, etc., the stigmas are short and thick; in the other, *S. sessilifolia*, etc., they are long and slender. Again, the whole group diverges into two types on the character of the leaves, in *S. exigua*, *S. argophylla*, etc., the leaves are coriaceous and opaque, while in *S. interior*, *S. sessilifolia*, *S. melanopsis*, etc., they are thin and distinctly veiny. Using these, together with other characters, it has been possible to make the following synopsis.

The changes in taxonomy have involved the rehabilitation of

all of Nuttall's species, a gratifying result which the writer did not anticipate when the work of comparison was under way. This necessitates the restriction of *S. fluviatilis* Nutt. to its original use as a name for the forms with long-pedicelled pistils. It is apparent that recent authors have interchanged the names *S. argophylla* and *S. sessilifolia*, thereby adding to the confusion of the Californian species. *S. brachycarpa* Nutt., usually referred as a synonym to some species of this group, does not belong here at all but is *S. stricta* (Anders.) Rydberg, *S. desertorum* Rich. of recent authors. Since Nuttall's is the oldest name it should stand.

Synopsis of Species

Leaves very small, 1 cm. long, awl-shaped; aments oval, 1 cm. long, gland in staminate flower one. 1. ***S. microphylla.***

Leaves larger, 2 cm. or more in length; aments more or less elongated, glands in staminate flower two or more (except in *S. Thurberi*).

Capsules hairy, at least when young.

Aments densely flowered, species of the Pacific slope.

Stigma raised on a distinct style.

Leaves linear-lanceolate, coriaceous; aments on long leafy peduncles.

Aments small, 1–2 cm. in length and few-flowered, usually in threes at the ends of the branches. 2. *S. taxifolia.*

Aments medium size, 3 cm. or more in length, cylindrical, many-flowered, usually solitary at the ends of the branches. 3. *S. Parishiana.*

Leaves elliptical or elliptical-lanceolate, membranous; aments larger on shorter peduncle.

Leaves densely silky hairy throughout; aments medium size, 2–5 cm. long. 4. *S. macrostachya.*

Leaves not densely silky; aments large, 6–8 cm. long. 5. *S. sessilifolia.*

Stigmas sessile; leaves entire or nearly so, stipules wanting. 6. *S. argophylla.*

Aments loosely flowered, species east of the Rocky Mountains.

Capsules silvery white with appressed silky hairs. 7. *S. Thurberi.*

Capsules thinly pubescent. 8. *S. interior.*

Capsules strictly glabrous.

Leaves entire or spinulose-denticulate, coriaceous.

Capsules pedicelled; leaves denticulate. 9. *S. fluviatilis.*

Capsules sessile; leaves entire. 10. *S. exigua.*

Leaves closely and prominently serrate, not coriaceous.

Leaves distinctly glaucous and prominently veiny beneath. 11. *S. melanopsis.*

Leaves not distinctly glaucous nor veiny beneath. 12. *S. Bolanderiana.*

1. SALIX MICROPHYLLA Cham. and Schlecht. Linnaea, **6**: 354. 1831

Heretofore this species has been considered identical with *S. taxifolia* H.B.K. A comparison of the original descriptions, both of which were very carefully drawn, indicates that the two are distinct. The plate and description by Hooker and Arnott in Bot. of Beechy, Voy. 31. *pl. 70*, confirms the conclusion that this species is distinct. I have seen but one specimen: Palmer's no. 1193, "a shrub 4 ft. high growing on the bank of a river" at Colima, Mexico. It is well said in Hooker and Arnott's description that this is "a very remarkable species of *Salix* with leaves like those of some small *Lythrum*." So far the pistillate plant has not been seen.

2. SALIX TAXIFOLIA H.B.K. Nov. Gen. et Sp. **2**: 22

This species is well described and illustrated in Sargent's North American Sylva. It has been collected by Pringle and Tuomey in Arizona, also by Pringle in Chihuahua, Mexico. It is a large shrub or small tree.

3. **Salix Parishiana** sp. nov.

A slender shrub, one to three meters high, bark grayish or brown, young twigs cinereous strigose: leaves linear-lanceolate, minutely and remotely denticulate, 5–7 cm. long by 3 mm. wide, silky canescent when young, glabrous and somewhat coriaceous when mature, veins few but very prominent: stipules none: aments on long leafy peduncles, appearing about April 1, 2–3 cm. long by 1–2 cm. peduncles often 10 cm. long, the upper leaves of the branch much surpassing the ament: ament densely flowered, scales white densely villous all over, oblong, acute: filaments scantly hairy at the base: capsules densely villous, oblong, closely sessile: style distinct: stigmas linear, three times as long as thick.

A very peculiar form, differing from *S. taxifolia* by its larger leaves and cylindrical aments and quite distinct from other species with linear stigmas.

CALIFORNIA: Matilija Cañon, San BernardinoCo. (F. W. Hobby, nos. 54, 55), Springs Valley, Inyo Co. (F. V. Coville and F. Funston, no. 263).

Mr. S. B. Parish writes "that it is not uncommon near San Bernardino."

4. SALIX MACROSTACHYA Nutt.

S. sessilifolia villosa Anderss. DC. Prodr. **16**[2]: 215.

Shrub or small tree 1–6 meters high, often in dense thickets, bark light brown, cinereous, young branches villous: leaves 5 cm. long, 1 cm. wide, sessile, entire or nearly so, oblanceolate or narrowly elliptical, acute at both ends, more or less villous pubescent, sometimes (as in Brewer's no. 544) lanate all over: stipules obsolete: aments on short, leafy, lateral branches, 2–3 cm. long, densely flowered, oblong, scales densely villous all over, oblong, filaments crisp, villous upon the lower half: capsules clothed with long lax hairs, closely sessile: style evident: stigmas divided, linear.

Salix macrostachya leucodendroides var. nov.

One to three meters high, wood soft: leaves much larger, 10–12 cm. long, 1 cm. wide, densely white tomentose on both sides, largest remotely denticulate: aments larger, cylindrical, 4–5 cm. long, otherwise as in the type.

Extremely broad leaved forms occur with texture and vesture of *S. Bebbiana*, leaves 4–6 cm. long, 1–1.2 cm. wide, ovate on short but distinct petioles, twigs, leaves and capsules densely villous with whitish spreading hairs.

This species has not been reported beyond the limits of California and Oregon. San Bernardino (W. G. Wright, nos. 6, 7, 10 and 11), Santa Rosa to Ukiah (W. H. Brewer, no. 3854), Lake Co. (E. L. Greene, no. 229), Putah Creek, Solano Co. (W. L. Jepson), Narsismente River (W. H. Brewer, no. 544), Martin Co. (W. H. Brewer, no. 2360), Clear Lake (H. N. Bolander, no. 3854). Specimens in herbaria representing this species are frequently labelled *S. Hindsiana*. From Bentham's description of *S. Hindsiana*, which is ample and concise, there is little doubt that his specimen was *S. argophylla*.

S. integrifolia var. *leucodendroides* is a very striking form from southern California collected by Mr. S. B. Parish, nos. 2134, 2040 and 640. There does not seem to be enough difference to warrant its separation as a species although intergrading forms are wanting. It grows in wet soil.

5. SALIX SESSILIFOLIA Nuttall, Sylva, **1**: 68. 1842

Salix sessilifolia Bebb, et al. (in part).

Shrubby or often treelike, 2–10 meters high, older branches

glabrous and brown : shoots very leafy, hoary puberulent : leaves membranous in texture, elliptical, acute at both ends, 5–10 cm. long, 1–2 cm. wide, closely sessile, obscurely and rather remotely denticulate, hoary with rather long pubescence when young, glabrous at maturity, veins prominent : aments large, upon lateral shoots 6–8 cm. long, .75–1 cm. thick, often three borne on a single branch, very densely flowered, six to ten leaves on the peduncle, flowering in July or late in June, scales oblong or obovate, rounded or retuse at the apex, nearly or quite glabrous, narrower in the pistillate ament, lower half of filaments very hairy, upper half minutely puberulent, capsule lanceolate, clothed with silky hairs when young becoming nearly glabrous at maturity, closely sessile : style evident : stigmas linear, several times longer than thick.

Shorter and relatively broader leaves, glabrous scales, pubescent capsule, evident style and linear stigmas are the distinguishing features of this species. The name was first applied to plants collected in the Columbia River valley.

OREGON: Sand Bars, Columbia River (T. J. Howell), Multnomah Co. (T. J. Howell).

6. SALIX ARGOPHYLLA Nuttall, Sylva, **1**: 71. *pl. 20.* 1842

Salix longifolia, var. *argophylla* Anderss. DC. Prod. **16**[2]: 214. 1868.

Salix fluviatilis var. *argophylla* Sargent, Sylva, **9**: 124. 1896.

Salix Hindsiana Bentham, Pl. Hartw. 335. 1857.

Tree or large shrub usually 5 meters high forming dense thickets but not growing in clumps, at any rate each bush distinct so far as the parts above ground are concerned, young twigs puberulent, branches nearly glabrous and exceedingly tough, bark turning from brown to bright yellow or orange just before blooming making a thicket of it a most conspicuous object: leaves narrowly lanceolate, 5 cm. long, 1–2 cm. wide, closely sessile, entirely or rarely minutely and remotely denticulate, clothed equally on both sides with an appressed silky pubescence which more or less conceals the veins, stipules obsolete (rarely on very vigorous shoots minute ones occur. Occasionally the leaves remain upon the plant over winter, the young shoots appearing in their axils in spring : ament surpassed in length by its leafy peduncles, 3–5 cm. long, 1–2 cm. thick, six to eight leaves on the peduncle somewhat smaller than the leaves on the shoot otherwise like them, aments often in pairs or threes at the ends of the branches, appearing in May in Oregon and northern California and flowering intermittently all summer, scales oblong and obtuse in the staminate

ament, narrower and more acute in the pistillate, glabrous on the back, crisp, hairy on the margin and toward the base, erose toward and at the apex, lower half of the filament densely crispy hairy: capsule lanceolate, covered with straight appressed silky hairs, closely sessile: stigmas sessile, oblong, about twice as long as thick, mature capsule often nearly glabrous.

This species is distinguished by its narrowly lanceolate entire leaves, obsolete stipules, small and rather narrow aments, erose scales and hairy capsules.

Salix argophylla occurs on the Pacific slope from southern California to British Columbia.

CALIFORNIA: Panamint Mountains (F. V. Coville and F. Funston, no. 788), Sierra Valley (J. G. Lemmon), North Idria (H. N. Bolander, no. 766), Yosemite Valley (Anderson), San Bernardino (W. G. Wright, nos. 3 and 4), Banks of the Merced (W. H. Brewer, no. 5031), Tulare Co. (F. V. Coville and F. Funston, no. 1267), San Bernardino (S. B. and W. F. Parish, nos. 640, 2140).

OREGON: Union Co. (W. C. Cusick, no. 1044), Hood River (J. and T. H. Howell).

WASHINGTON: Klickitat Co. (W. N. Suksdorf, no. 34), Sprague (Leiberg and Sandberg, no. 134); British Columbia: Spences Bridge, Thompson River (J. M. Macoun, no. 13).

7. **Salix Thurberi** sp. nov.

Slender shrub two or three meters high; bark of older branches brown and glabrous, younger branches puberulent: leaves linear-lanceolate, 6–8 cm. long, 2–3 mm. wide, sessile, evenly denticulate, thin, midrib prominent, silvery silky when young, becoming glabrate: stipules none: aments on long leafy peduncles 5–6 cm. in length: flowers borne in verticels, axis silvery canescent, scale lanceolate, acute, midvein prominent: capsule densely clothed with silvery white ascending hairs, very short pedicelled, gland about equaling the pedicel: style very short: stigmas divided: red, stamens with filaments hairy below, gland in staminate flower one.

This species occurs in southern and western Texas and was observed and collected there by Geo. Thurber many years ago. His specimens (nos. 2368, 95, and 2341) are in the Gray Herbarium. It has been referred heretofore to *S. interior;* it is easily distinguishable from that species by the long thin leaves, single

gland in the staminate flower, silvery silky capsules, and red stigmas.

8. **Salix interior** nom. nov.

Salix rubra Rich. Franklin Journ. App. **7**: 765. 1823. Not Huds. 1762.

Salix longifolia Muhl. Neue Schrif. Gesell. Nat. Berl. **4**: 238. *pl. 6. f. 6.* 1803. Not Lam. 1778.

Salix fluviatilis of Sargent and other recent authors in part.

Varying in stature from a low shrub to a small tree, usually growing along streams and lake shores: twigs smooth and brown to densely tomentose and gray: buds plano-convex with an obtuse and rounded apex, very small: leaves nearly or quite smooth, sparsely canescent, to extremely canescent, sessile, linear-elliptical, ordinarily 8–10 cm. long and less than 1 cm. wide, varying to much wider in young vigorous shoots, remotely dentate, the teeth narrow, sometimes quite spinulose: stipules conspicuous, ear-shaped, obscurely denticulate, deciduous: aments of late spring on short lateral peduncles, which bear four to six leaves, those borne later in the season on much longer leafy branches, very loosely flowered, the flowers fascicled in clusters of two to five on the axis, a distinct interval between the fascicles, first appearing in May and often bearing a second set of aments in early summer; at anthesis, aments 2–4 cm. long and 1–2 cm. thick; scales usually glabrous or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous, after flowering: glands large, two in the staminate, one in the pistillate flower: filaments crisp hairy below, smooth above: capsules sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity: stigmas short, sessile: style none.

The pistillate ament, lax at anthesis, becomes more so as the capsules mature and by this character the species can easily be distinguished from related species.

Salix interior Wheeleri var. nov.

Low shrub: young twigs whitened with appressed silky hairs, becoming glabrous toward the end of the first season's growth: leaves relatively short and broad, 7–8 cm. long by 1 cm. broad, minutely and evenly denticulate, closely sessile, densely silky on both sides, veins nevertheless evident, rather abruptly acute.

Throughout the Upper Mississippi valley and the basin of the Great Lakes. Also occasionally upon the eastern slopes of the

Allegheny Mts. Specimens representing the species have been seen as follows:

MISSOURI: St. Louis (H. von Schrenk).

ILLINOIS: Rockford and Fountaindale (M. S. Bebb).

MINNESOTA: Redstone (H. Mann).

MICHIGAN: Flint (D. Clarke).

OHIO: Painesville (H. C. Beardslee, nos. 48 and 73).

NEW YORK: Buffalo (G. W. Clinton); Cayuga Lake (W. R. Dudley).

PENNSYLVANIA: Easton (A. P. Garber), McCalls Ferry (T. C. Porter).

The variety *Wheeleri* is confined to the basin of the Great Lakes. Specimens have been seen from:

ILLINOIS: Fountaindale (M. S. Bebb, nos. 118 and 119).

MICHIGAN: Flint (D. Clarke), Black Lake, Choboygan Co. (C. F. Wheeler, no. 3).

OHIO: Painesville (H. C. Beardslee, no. 67).

ONTARIO: Point Abino (W. W. Rowlee).

PENNSYLVANIA: Presque Isle, Lake Erie (T. C. Porter).

NEW BRUNSWICK: Frederickton (J. Britten, nos. 4 and 6). The silvery vesture of this shrub is much like that of *S. argophylla* of the Pacific Coast.

Narrow-leaved individuals occur in the extreme western and southwestern range of the species, and seem to connect this species with the preceding:

MISSOURI: Courtney (B. F. Bush, no. 9).

NEBRASKA: Emerson (Clements, no. 2509). The vesture of the capsule, and the glands in the staminate flower afford a decisive distinction between them.

9. SALIX FLUVIATILIS Nutt. North Am. Sylva, **1**: 73. 1842

Salix longifolia pedicellata Anderss. Sven. Vet. Akad. Handl. IV. **6**: *f.* 35. 1867.

Distinguished from the next species to which it is closely related by its pedicelled capsules and by its remotely denticulate leaves. It has the same general range as *S. exigua* but seems to be much less frequent.

COLORADO (Hall and Harbour, no. 132) (Brandegee).

NEW MEXICO: Pecos River, San Miguel Co. (A. A. & E. G. Heller, no. 3684); North American Pacific Coast Flora, etc. (C. C. Parry, no. 306).

10. SALIX EXIGUA Nuttall N. Am. Sylva, 1: 75. 1842

Salix Nevadensis Watson, Am. Nat. 7: 302. 1873.

Variable in stature from a low slender shrub to a small tree: branches light brown, leaves 4 cm. by 1–2 cm., yellowish, closely sessile, opaque, entirely or nearly so, canescent when young, usually becoming quite glabrous at maturity, very narrowly elliptical, veins very indistinct, stipules none: aments 2–5 cm. long on peduncles about the same length, appearing with the leaves, rather densely and evenly flowered, sometimes the lower flowers remote, scales in the staminate ament oblong to obovate, in the pistillate narrower and longer, smooth or more or less crisp villous on the margins: capsule closely sessile, lanceolate, glabrous, light green: stigmas short and thick, sessile, sometimes even appearing slightly sunken in the apex of the capsule.

Readily distinguished from related species by its entire opaque leaves and glabrous capsules.

Salix exigua virens var. nov.

Leaves large, 10–12 cm. long, 1 cm. wide, nearly glabrous, veins conspicuous on both sides, distinctly denticulate: stipules large, oblong denticulate: aments large, the pistillate 4 cm. long, 1 cm. thick, sometimes borne in threes at the ends of the long leafy shoots.

Easily distinguished from the type by the size and texture of the leaves and the presence of stipules.

Salix exigua occurs throughout the Rocky Mountain region of the United States, but has not yet been reported from British America or Mexico. It seems probable, however, that it will be found both north and south of the range indicated. Prof. Aven Nelson observes that in Wyoming this species grows on positively the "worst alkali soil that can be imagined, where it is small, slender, and twig-like, but of dense growth."

CALIFORNIA: Surprise Cañon and Hot Springs, Inyo Co. (F. V. Coville and F. Funston, nos. 722 and 681), San Bernardino (W. G. Wright, no. 2), Cashewberry Springs, Mohave Desert (S. B.

Parish), Aqua Caliente, Colorado Desert (S. B. and W. F. Parish, no. 729).

ARIZONA: San Francisco Mountains (H. H. Rusby, no. 371), Tuçson (G. Vasey, no. 7); Nevada (S. Watson), Virginia City (Bloomer).

UTAH: Dirty Devil River (L. F. Ward, no. 399).

NEW MEXICO: Crow Agency (T. C. Porter, no. 5).

COLORADO: Platte River (T. C. Porter, no. 6), Ft. Collins (C. F. Baker, nos. 4 and 5), Headwaters of Clear Creek (H. N. Patterson).

WYOMING: Bitter Creek, Platte Cañon, Pine Bluffs, Ft. Steele, Laramie (A. Nelson, nos. 245, 2740, 2885, 3102, 3137), Yellowstone Park (J. N. Rose, no. 90), Ft. Bridger (T. C. Porter).

SOUTH DAKOTA: Hermosa, Black Hills (P. A. Rydberg, no. 1020).

MONTANA: Jefferson River (F. L. Scribner), Jacks River (W. M. Canby, no. 3) (Tweedy).

IDAHO: Lewiston (A. A. Heller, no. 3007).

WASHINGTON: Pullman (C. V. Piper, no. 1774).

OREGON: Umatilla River (J. and T. H. Howell).

The variety *virens* is quite distinct and may upon further investigation prove to be of specific rank. It is apparently confined to Arizona and southern California.

ARIZONA (J. T. Rothrock).

CALIFORNIA: San Bernardino (W. G. Wright, no. 2), Dos Cabesas (C. R. Orcutt, no. 2227); Kernerville (W. G. Wright; Santa Isabel Creek, San Diego Co. (R. D. Anderson, no. 700), A. Kellogg and W. G. Harford, no. 922), banks of the Merced, near Clarks (H. N. Bolander, no. 5031).

11. SALIX MELANOPSIS Nuttall, Sylva, 1: 1842

"Shrub or small tree, bark of old branches dark chestnut brown to nearly black, young branches puberulent, very leafy: leaves oblanceolate or elliptical, closely sessile, 5 cm. long, 1 cm. wide, on vigorous shoots, glabrous when mature, silky hairy when young, very distinctly veiny beneath, somewhat glaucous, the margin with rather low and close serrations: stipules lanceolate, few toothed: aments long and slender, often flexuous on peduncles which bear 5–8 leaves, 5–7 cm. long, 1–2 cm. thick, cylindrical, loosely

flowered at the base, scales linear-oblong, more or less erose at the apex, filaments hairy to the middle, or rarely nearly glabrous: capsule lanceolate, glabrous, short-pedicelled, pedicel however not longer than the gland: style very short and stigmas short and thick: ovary smooth with four sessile stigmas." (Nuttall.)

Typical specimens show a strong resemblance to *Salix nigra*.

Salix melanopsis is confined to the western slope of the Rocky Mountains and occurs from British Columbia to Oregon. It is particularly abundant along the Columbia River where Nuttall saw it. Its leaves are very large especially upon young shoots. Specimens collected in Cowlitz Co., Washington, by Mr. Coville, have remarkably large leaves and pistillate aments. Specimens seen are as follows:

OREGON: Cow Valley, Eagle Creek Mountains (W. C. Cusick, Nos. 1800a, 1303), Blue Mountains (L. F. Henderson) (E. Hall).

WASHINGTON: Pehistin (Sandberg and Leiberg, no. 480), Klickitat Co. (W. N. Suksdorf, nos. 35, 36, 37, 38); Snoqueline Falls, King Co. (C. V. Piper and E. C. Smith, no. 614).

BRITISH COLUMBIA: Revelstoke, Long Arrow Lake, Upper Liaird River, wet places, Valley of Fraser River, Columbia River Valley (J. Macoun, nos. 6, 23, 26, 28, 28a).

12. **Salix Bolanderiana** sp. nov.

Bark of older branches nearly black: aments 4 cm. in length, the pistillate fully 1 cm. thick, borne on long leafy branches: leaves 8 cm. long, 1 cm. wide, closely and very finely serrate, scale spatulate, filaments crisp villous throughout: capsule ovate, closely sessile: stigmas minute, sessile.

In the Yosemite Valley in California (Bolander, nos. 49, 58, 4958, 5031).

Explanation of Plate 8

1. *Salix microphylla.*
2. *S. taxifolia.*
3. *S. Parishiana.*
4. *S. macrostachya.*
5. *S. macrostachya Cusickii.*
6. *S. macrostachya leucodendroides.*
7. *S. argophylla.*
8. *S. sessilifolia.*
9. *S. Bolanderiana.*
11. *S. exigua virens.*
12, 13. *S. interior.*
14. *S. interior Wheeleri.*
15. *S. exigua.*
16. *S. melanopsis.*

New Plants from Wyoming—XII

By Aven Nelson

I. THE CORMOSE-ROOTED ROCKY MOUNTAIN CLAYTONIAS

The cormose-rooted species of *Claytonia* are certainly still in confusion; especially is this true of the forms that at various times have been called *C. lanceolata* Pursh; under this name and its supposed synonyms there seems to be more than one species. To clear up some of the difficulties, if possible, is the object of this discussion.

To begin with, the first factor of simplification is found in locating the *C. lanceolata* of Pursh. That Pursh's description as well as his figure was, through some error, drawn from two or more species, was first suggested by Torrey and Gray in Fl. N. A. **1**: 199. No specimens are in existence which have the combination of characters assigned by Pursh in his description and indicated in his figure. This led Dr. Torrey in Pac. R. Rep. **4**: 70, to speak of it as a "fictitious species" and to assign (to the same plant as he supposed) the name of *C. Caroliniana sessilifolia.* On the other hand, the characters that Dr. Torrey assigns to the plant from which he drew his description, and of which there are many recent collections, make it necessary to separate them, at least varietally, from the *C. lanceolata* of Hooker, Fl. Bor. Am. **1**: 224; T. & G. Fl. N. A. 1 c., and Syn. Fl. **1**: 271.

Since the name *C. lanceolata* Pursh must be retained it will have to apply to the plant of that name of Hooker, of Torrey and Gray and of the Syn. Fl. To make the distinctions between the species and the variety evident, descriptions of both are added.

Claytonia lanceolata Pursh

One dm. or more in height; root leaves rare (usually wanting) never more than one even when there are two or three stems as occasionally happens, the slender petiole 2–3 times as long as the oblong-lanceolate blade: stem leaves sessile, oblong-lanceolate to elliptic or even broader (venation much the same in all the species in the group), 2–3 cm. long: inflorescence few–several-flowered, appearing sessile between the paired leaves which nearly equal or

more rarely exceed the raceme: peduncle short or none: the pedicels slender, more or less nodding, the lowest elongated: sepals elliptic, obtuse: petals obovate, retuse or emarginate, sometimes nearly obcordate.

The range of this species is the Rocky Mountains of British America, south as far as northern Wyoming; my no. 5608, Yellowstone Park, July 1, 1899, represents the most southern locality known to me.

The specimens cited from the Sierras of California and from the Wasatch of Utah, I suspect, belong to the following.

Claytonia lanceolata sessilifolia

C. Caroliniana sessilifolia Torrey, l. c., and of Brewer & Watson, Bot. Cal.

Corm and radical leaves similar to those of the preceding: stem leaves longer, usually oblong-lanceolate, 2–5 cm. long: peduncles longer, the racemes at length distinctly surpassing the leaves: sepals subacute: petals spatulate to obovate, entire, rounded-obtuse, pale rose color with purple veins.

This variety seems to range from California eastward to Colorado and Wyoming, in latitudes distinctly to the south of the species. That there are differences between the more eastern and the far western forms of it is certain. Also great variation in the plants of different altitudes, but these are so inconstant that, with our present knowledge of them, they may not be separated.

Claytonia multicaulis

Stems few–several (3–8) from each tuber, spreading loosely in all directions, with ascending inflorescence, 5–15 cm. long: root leaves probably always present, 1–several from each tuber, about equaling the stem proper, narrowly oblong to oblanceolate, the blade as long or longer than the petiole: the stem leaves narrowly oblong or lanceolate, obtusish, 2–4 cm. long, so situated as to divide the stem (including the inflorescence) into approximately equal parts: inflorescence 5–9-flowered, on a peduncle 1–2 cm. long, a broadly ovate, obtuse, green bract at the base of the lowest pedicel: pedicels slender, 2–3 cm. long, subumbellate, the tip nodding-recurved except in anthesis: sepals rhomboidal, obtuse, less than half as long as the petals, thin and drying a light yellow, as does also the base of the petals: petals broadly elliptic to oval, abruptly narrowed at base into a very short claw, 7–10 mm. long, white with pinkish or purplish veins.

An abundant species on gravelly, open slopes in Yellowstone Park. My no. 5553, June 28, 1809, near Golden Gate, is taken as the type. It is probably the *C. lanceolata* of Tweedy's Flora of the Park in part only as *C. Purshii* also occurs in the Park.

Claytonia aurea

Related to the preceding: corms somewhat larger, deep set: usually one root leaf present, rarely more, its petiole slender, nearly twice as long as the narrowly oblong or oblanceolate blade: stem leaves sessile by a narrowed base, linear-lanceolate, tapering gradually to both ends, 2–4 cm. long: stems 1–5 from each tuber, suberect, 1–2 dm. high, the paired leaves mostly below the middle (inflorescence included): peduncular part of the stem about equaling the stem leaves as does the stem proper the root leaves: the raceme many-flowered (7 or more), pedicels divaricate and becoming more or less reflexed, about 2 cm. long: sepals rhomboidal or suboval, subscarious and finely veined: petals golden yellow, 8–10 mm. long, broadly oval, abruptly narrowed into a claw about one fourth as long as the blade.

Yellow is anomalous not only in this genus but in this family, yet that it is a good *Claytonia* there can be no doubt. In the preceding species the xanthic tendency is shown in drying only while in this the yellow is most pronounced. The type specimens, no. 5488, were secured on low, wet flats near Henry's Lake, Idaho, June 22, 1899.

Oreobroma minima

Root short conical or napiform, from 5 to 20 mm. long, the leaves and scapes arising in a close cluster from the center of its somewhat truncate summit: leaves few–several, narrowly linear, 4–7 cm. long, moderately fleshy: scapes rarely equaling the leaves, mostly shorter, each with a small pair of bracts about ⅓ its length from the base, geniculately and divergently flexed near the single node: sepals sub-oval, abruptly acuminated into a short tooth, sometimes with one or two smaller lateral teeth, no glandulosity: petals white: capsule large, approaching 1 cm. in length: seeds smooth and shiny, 60–80 in each capsule.

The nearest ally of this is probably *O. Grayi* (Britton) Rydb., from which it is at once separated by its very different root-caudex, its slender leaves, its geniculate scapes, its glandless and not erose sepals, its large, many-seeded capsule and white flowers.

Collected on the wet grassy banks of a sub-alpine creek—a

very different habitat from the dry gravelly banks and slopes occupied by *O. Grayi.* Obsidian Creek, Yellowstone Park, July 22, 1899, no. 6076.

II. MISCELLANEOUS SPECIES

Ranunculus Jovis

A diminutive alpine perennial, 3–4 cm. high: roots fascicled, fleshy, 2–several, nearly vertical, 1–3 cm. long: root leaves few (1–3), trifoliate or trifid, the leaflets broadly linear, about 15 mm. long: petioles 2–3 times as long as the leaflets: stem single, erect, about equaling the erect petioles, bearing a single flower and a sessile, trifoliate or trifid leaf similar to the root leaves (rarely a second petioled leaf): peduncle 7–15 mm. long: petals oblong-spatulate, 6–7 mm. long, slightly exceeding the somewhat broader sepals: akenes (immature ones only at hand) in a spherical head, oval, the beak stout, subulate, nearly straight, as long as the akene.

In many respects nearly allied to *R. pygmaeus* Wahl. but readily distinguishable by the uniform leaves, the longer, not reflexed petals and the straight beak of the akenes.

The type no. is 5817, collected on the Thunderer, Yellowstone Park, July 13, 1899, by Messrs. Elias Nelson and Leslie Goodding. Not abundant; growing on naked "slide soil" where snow drifts had but lately lain.

Delphinium occidentale reticulatum

Several- to many-stemmed from semi-woody roots, erect with usually somewhat decumbent bases, 6–12 dm. high: stems glaucous, strongly striate below: leaves finely pubescent especially upward, not glandular, 3–5-divided, the divisions broadly cuneate, 3-cleft into more or less toothed lobes, the ultimate segments lanceolate and tipped with a minute callosity: inflorescence mostly simple, the bracts linear and the lower leaf-like: the rachis pubescent, somewhat glandular: the pedicels densely glandular-pubescent, divaricate-ascending, with linear bractlets: flowers a dull or dark blue, more or less streaked with yellowish-white: sepals lightly pubescent, oblong, 12–14 mm. long: the straight spur about 15 mm. long, its ovate blade about 10 mm.: the lower petals with narrow claw equaling the ovate, bifid, dentate blade, 10 mm. long, either sparsely or densely bearded: follicles erect, 1 cm. long, conspicuously reticulated with dark lines: seeds evidently wing-margined.

It seems very doubtful if any true *D. occidentale* Wats. Bot. Calif. **2**: 428, comes within our range. Though it belongs in the interior, it is of the more western mountains rather than of the Rockies. Its limits seem to be well stated by Howell (Fl. N. W. Am. **1**: 24). The dense stiff glandular pubescence mentioned by Watson, the spatulate sepals mentioned by Howell, and the usually glabrous ovaries and spongy seeds are some of the points that distinguish it. The variety now proposed is described in detail since the descriptions of *D. occidentale* are most of them very brief and as a species it is not well known. It is probable that many of the Rocky Mountain plants labelled *D. occidentale*, *D. scopulorum*, *D. scopulorum glaucum*,* etc., belong to this variety. The type number is 6629, Bridge Bay, Yellowstone Park, Aug. 23, 1899. It was very abundant. Other collections are no. 6936, Dunraven Peak, 1899; no. 874, Union Pass, 1894.

Delphinium cucullatum

Stems numerous, from thick and semi-woody roots, 10–15 dm. high, striate, glaucous below and glabrous nearly to the inflorescence, rather leafy: leaves all finely pubescent, the uppermost densely so, orbicular in outline, 10–20 cm. in diameter, 3–7-divided, the divisions cuneate and very irregularly cleft and gashed at the apex: inflorescence dense, paniculately branched below, very closely and somewhat cinereously pubescent on rachis and pedicels: sepals yellowish-white or tinged with blue, finely but densely pubescent (no glandular pubescence on the plant), the four nearly alike, oblong-elliptic, about 1 cm. long, the spur 12–14 mm. long, all distinctly hooded in bud and in recently opened flowers, the crown of the hood brownish: petals a bright blue, the lower pair about 9 mm. long; the blade nearly at right angles to the claw, cleft to near the middle, the two lobes usually obscurely toothed; the claw with a conspicuous saccate gland or nectary at the base: ovaries densely white pubescent.

This species must represent in part the *D. occidentale* of the Rocky Mountains. In fact, Dr. Rydberg assures me that it is very similar to Dr. Watson's no. 38, which was included in the original description but later called *D. scopulorum glaucum* by Dr. Gray. It is also the same as Mr. Flodman's no. 455 from Montana. It

* *D. glaucum* Wats. Bot. Calif. **2**: 427 belongs exclusively to the mountain ranges of the far West.

need never be confused with *D. occidentale* nor its variety, nor with the recently described *D. glaucescens* Rydb., Mem. N. Y. Bot. Gard. **1**: 155. From all of these its fine, glandless pubescence, its dense inflorescence and especially the remarkable nectaries at the base of the lower petals distinguish it. The type is no. 6937, from the wet bottom lands, Snake River, near the southern boundary of Yellowstone Park, August 12, 1899.

Delphinium subalpinum (Gray)

Perennial from deep-set, woody roots, growing in large beds, —not merely several stems from each root but the plants aggregated in beds often several feet across—6–10 dm. high: stems simple, striate, pubescent for most of their length with a yellowish or tawny pubescence, more densely so upward and in the inflorescence becoming slightly viscid (not glandular): leaves large, suborbicular, deeply cleft into about 5 lobes, rarely divided nearly to the base, the segments variously incised and gash-toothed, nearly glabrous on the blade but minutely pubescent on the petiole and the base of the leaf, especially on the lower face: raceme simple, short, usually only about 1 dm. long, the pedicels longer than the rather long spur: flowers a very deep blue, the spur 15–20 mm. long, the other sepals narrowly oblong, about 15 mm. long, subacute; the lower petals with a narrow claw, about 10 mm. long, the blade oval, deeply notched and more or less dentate on both lobes: ovaries glabrous, blue but not so deeply so as the sepals and petals.

Only a few specimens of this are at hand yet I am satisfied that it is the *D. scopulorum subalpinum* Gray, Syn. Fl. **1**: 47 and Bot. Gaz. **12**: 52 but not the *D. occidentale* Wats. Bot. Calif. **2**: 428, though Gray cites the latter as a synonym. The habit of growth, the ample leaves, the deep uniform color of the flowers, the short raceme and the short spreading fulvous pubescence make it easily recognizable among all the other forms. It is, too, really subalpine, so far as known to me, occurring only in open grassy parks near the limit of trees. Collected twice in the Medicine Bow Mountains (La Plata Mines) and distributed under nos. 1761 and 5081, the latter by Elias Nelson.

Delphinium strictum

A strict perennial, 3–4 dm. high, from a small fascicle (sometimes but 1) of semi-woody, tuberous or cormose roots bearing

fibrous rootlets: pubescence fine; that of the stem (especially below) of short, recurved hairs, becoming closer and more spreading above on the leaves and inflorescence: leaves trifoliate; the leaflets again 3-parted or variously lobed, the segments 1–3 cm. long, from narrowly oblong in the lower leaves to linear in the uppermost; the lower early deciduous, the uppermost sessile and greatly reduced: petioles erect or approximated to the stem, somewhat dilated at the base, the lower longer than the leaflets, gradually shorter upwards: inflorescence a dense spike, rarely much exceeding 1 dm. in length; the pedicels short, erect and rather stout: flowers from a deep to a dingy blue; the spur straight with merely a flexed tip, exceeding the petals and pedicels in length, standing nearly at right angles to the rachis; the lateral petals deeply cleft, about 1 cm. long, very sparsely long hairy: follicles 3, pubescent, ovate, acuminated into the short style, not divaricate, when mature 6–8 mm. long: seeds numerous, irregular, the coats smooth and sharply wing-angled.

That this is allied to the little known *D. simplex* Dougl. there can be little doubt but its smaller size, different pubescence, broader and shorter leaf segments, short (not acuminate) spike, the relatively shorter spur which is not subulate-pointed and probably different habitat will serve to distinguish it.

It occurs in abundance in a few of the meadows of the upper Jackson's Hole country, preferring wet, almost boggy places where grasses and sedges abound.

Type specimens from Snake River, August 13, 1899, no. 6442.

Draba saximontana

Caudex caespitose, profusely slender branched, branches more or less clothed with the imbricated dead leaves: leaves linear, 5–10 mm. long, imbricate on the crowns, sparsely stellate-pubescent on both sides, obscurely ciliolate, midrib evident: first flowers nearly sessile, raceme lengthening and becoming open, fruiting raceme (scape) 3–7 cm. long, glabrous: petals yellow, broadly spatulate, truncate or retuse, nearly twice as long as the elliptic, glabrate sepals: pods narrowly ovate, base rounded, apex sub-acute, glabrate or sparsely pubescent with short, simple hairs, 4–5 mm. long, 6–8 times as long as the style and only half as long as the longest pedicels: stigma not expanded: ovules few, 2–3 in each cell, only one or two maturing.

Probably specimens of this exist in the herbaria as *D. glacialis* Adams, but from that species its few-seeded pod and nearly glab-

rous inflorescence separate it, as do also the very numerous and slender branches of the caudex. *D. saximontana*, in many respects, is nearer to *D. oligosperma* Hook. but it seems to be seperated from the original arctic form of that by easily recognized characters. First, it is to be noted that that had white flowers, a fact stated not only in the original description (Hook Fl. Bor. Am. 1 : 51) but in an added note. *D. oligosperma, l. c.*, is compared to *D. hirta* L. as a petal and habit which is further evidence that that is very different from this plant. *D. oligosperma* also seems to have had a lobed ("sub-triplo") stigma and more numerous seeds.

D. saximontana is abundant in a few of the foothill slopes of the Laramie Plains, mostly on stony ledges that are partly sand-covered. Collected a number of times but no. 4323 may be cited as type.

Thlaspi parviflorum

Biennial or possibly more enduring, with a simple, vertical tap-root, glabrous throughout, 1–2 dm. high : stems few to several from the crown, simple, ascending or erect : crown leaves small, 5–10 mm. long, rather numerous, elliptic to oval, short-petioled : stem leaves 5–10, oblong, obtuse or sub-acute, sagittate-clasping, the sinus shallow : raceme simple (rarely a branch or two from the upper leaf axils : pedicels widely divaricate, scarcely longer than the capsule : sepals ovate, mostly obtuse, greenish with a white margin and purplish spot near the tip : petals white, spatulate, 2–3 mm. long, about twice as long as the sepals : capsule spatulate, in dried specimens often appearing unequilateral, barely emarginate, 5–7 mm. long, 8–10-seeded, only slightly flattened, not winged but rather strongly margined : style thick, only about .5 mm. long.

This is a peculiarly distinct species, and one not readily confounded with any of the numerous forms usually referred to *T. alpestre* L. The small flowers and rather slender tap-root and the narrow capsule will easily distinguish it even without reference to the shape of the floral parts. Seemingly abundant on open slopes in the northwestern part of Yellowstone Park. Glen Creek, June 28, 1899, no. 5554.

Potentilla virgulata

Root thick and subfleshy, its one or two crowns scaly : stems 1 only from each crown, simple, erect, 3–4 dm. high, lightly pubes-

cent, no tomentum nor silkiness, very obscurely granulo-glandular as are also the leaves: root leaves few to several, dark green above with obscure pubescence, light green below with a close pubescence, erect, on petioles 8–16 cm. long, pinnate with 5–7 leaflets: leaflets obovate in outline, dissected, the segments linear and extending nearly to the thickened midrib, the margins obscurely revolute thickened; the terminal leaflet petiolulate; the paired ones approximate but not crowded, if three pair equidistant: stem leaves similar, only 2–4, with gradually shorter petioles, the uppermost usually sessile; the stipules ovate-lanceolate, often acuminate: cyme several-flowered, congested, the first two pedicels somewhat elongated, the succeeding ones short: hypanthium moderately pubescent: bracts linear, equaling the lanceolate sepals: petals small, orbicular, scarcely depressed at summit, only about 4 mm. long, a little shorter than the sepals: style glandular at base, terminal, not longer than the mature akene.

This is related to *P. Pennsylvanica* but that has leaves less dissected, more whitened or even tomentose below, stipules somewhat laciniate, the stems stouter and the leaves more lax, larger, obovate petals which equal or exceed the sepals. In character of pubescence the proposed species is nearer *P. atrovirens* but from that it is at once distinguished by its strict habit and congested inflorescence.

It has been secured but once, no. 6011, from a wet, grassy flat, near Mammoth Hot Springs, July 20, 1899.

Potentilla Monidensis

Perennial from a deep-set, woody root which is surmounted by a much branched, woody caudex; the branches of the caudex densely clothed with old, brown leaf-bases: stems numerous, 1–several from each crown, prostrate-assurgent, rather slender, silky-strigose, 1–2-leaved, 7–14 cm. long: leaves crowded on the crowns, petioled, 4–6 cm. long (including the petiole), silky-strigose above, white with dense, hirsute-silkiness below, pinnate, with 3–7 pairs of approximate leaflets (occasionally odd leaflets interspersed); the basal leaflets digitately cleft nearly to the rachis into oblong-linear segments; the obovate apical ones pinnately cleft to the midrib into similar segments: stem leaves much reduced, mostly cleft into linear segments: hypanthium silky-hirsute, the narrowly lanceolate bracts a little shorter and narrower than the lanceolate sepals: petals broadly elliptic or oval, somewhat exceeding the sepals, about 6 mm. long and 4 mm. broad: style slender, not glandular, attached above the middle of the akene, about 3 mm. long.

This strikingly caespitose species has no very near ally. It seems to be nearest *P. Macounii* though it may in some ways be compared with *P. saximontana* and *P. Plattensis*. From all of these it differs in the shape of the petals and its denser pubescence; from the two former in the absence of all tomentum and in the narrower leaf-segments; from the latter (which has no whitish pubescence) in the stouter, more branched and scaly caudex.

It was plentiful on the high, open slopes among the sage-brush, near Monida, Montana. Type no. 5414, June 16, 1899.

Anogra Buffumi

Annual, root slender, vertical: stem erect, 2–3 dm. high, simple or with two or more smaller, erect, accessory ones from the crown: pubescence of two kinds—some scattering, hispid-ciliate hairs and a fine puberulence, nearly glabrous upward: leaves numerous, linear-oblanceolate, from entire to repandly toothed, the radical slender petioled, 6–12 cm. long (including the petiole), the stem leaves shorter and shortening upward: inflorescence leafy: flowers axillary, at first crowded, becoming more open as the stem lengthens: calyx lobes about equaling the tube, 2 cm. long, shorter than the suborbicular, white petals: filaments very slender, as long as the calyx lobes: capsules linear-clavate, spreading and curved, 2–3 cm. long.

This seems to be a very rare plant. Though twice collected, both times on Wind River, in Fremont county, only single specimens were secured—the first by Prof. B. C. Buffum, August 2, 1892; the second by the writer in 1894, August 9, no. 779.

Those specimens were named *A. albicaulis* (Pursh) Britt., but their erect habit and nearly glabrous inflorescence show at once that that cannot be. It may be worth while noting that the large white petals dry the same color in herbarium specimens, but if left to dry on the plant in the field they turn pink, as commonly occurs in this genus, no matter how they are dried.

This with one or two other species must all in a general way be associated with *A. albicaulis*, but each shows characters in keeping with the duration of the plant.

Lappula desertorum foliosa

Habit of the species, *i. e.*, diffusely and profusely branched from the base: the rather slender branches very leafy throughout,

10–20 cm. long, floriferous nearly to the base but more remotely so downward; even the uppermost bracts leaflike: nutlets all alike, the aculeae connected at base and forming a narrow winglike margin, minute papillose on all sides.

The recent segregation of the allied forms of *L. occidentalis* (Wats.) Greene (Pittonia, **4**: 93–97) seems the most rational treatment that this group has received. Probably as more specimens are accumulated, the descriptions as drawn may need to be made a little more elastic in order to include some forms that show environmental variations. The variety here proposed, however, seems to be more than that. It is a plant of the arid plains, in sandy soil, among the underbrush. No. 4502, Evanston, June 4, 1898, and 4685, June 13, 1898.

Lappula erecta

Annual, possibly sometimes biennial, with a vertical or ascending tap root: stems 2–5, more rarely only one, simple, erect, more or less paniculately branched above, 2–4 dm. high, cinereously strigose-pubescent, moderately appressed: crown leaves rather numerous, rosulate, oblanceolate, short-petioled, variable in size but rather small: stem leaves broadly linear or linear-oblong, sessile by a broadish base or tapering into a short petiole, 1–4 cm. long, pubescence a little harsher than that of the stem and the base of the hairs more distinctly pustulate: spikes panicled, from rather open to much crowded; bracts resembling the leaves, but smaller, somewhat ciliate on the margins: nutlets all alike, minutely and densely muricate-tuberculate on all sides with the muriculations in the median line of the dorsal face a little more prominent than the others, a single marginal series of about 10 aculeae which are distinct to an obscure marginal ridge.

On account of the confusion that has existed in regard to *L. Texana*, as understood by Dr. Greene (Pittonia, **4**: 94), and *L. occidentalis*, according to the same authority (*l. c.*, 97), this species has long remained unnamed, though undoubtedly often collected. It has been ticketed at different times with both of the foregoing names, and perhaps as often as *L. Lappula*. To the latter it bears much resemblance as to habit, but the nutlets at once distinguish it. It may also be compared to the recent *L. collima* Greene, but from this it is also very distinct by the nutlets, a different pubescence, and the less noticeably rosulate leaves.

The following numbers represent it: 424, Uva, July 7, 1894; and Soda Butte, Yellowstone Park, July 15, 1899, 5872.

Mimulus thermalis

Annual, erect, simple stemmed, only a few cm. high (3–15), dull green and more or less tinged with red, glabrate below, puberulent upward, not viscid nor glandular: leaves 2–5 pairs, nearly orbicular, obscurely dentate, closely sessile or the lower on very short petioles, mostly obtuse, the uppermost abruptly short toothed, 3–5-nerved from the base, all small (3–9 mm.), often floriferous to the base: flowers in pairs in the axils, sometimes a single terminal flower or with the pair immediately below appearing cymose; the lower pedicels (in large plants) elongated and with a pair of leaf-like bracts above the middle, in small plants slender and not much longer than the calyx: calyx narrowly campanulate, strongly carinate-angled, somewhat oblique, in fruit 1 cm. long, its teeth short, the upper about twice as long as the others: corolla about 15 mm. long, funnelform, the tube nearly equaling the limb and but little exceeding the calyx, yellow, bilabiate, short pubescent on the lower lip: capsule shorter than the calyx, conspicuously stipitate; the seeds numerous, small, elliptic, the surface obscurely checkered by longitudinal and less distinct transverse lines.

I am unable to find a close ally for this species but its characters would place it into the section in which *M. nudatus*, *M. nassutus* and *M. microphyllus* are conspicuous members. It was secured in Yellowstone Park where it occurs more or less freely on the formations in the vicinity of the hot springs and geysers. The type is no. 6285, Upper Geyser Basin, Aug. 3, 1899.

Castilleja lauta

Perennial, from a short, thickened, woody caudex: stems several or sometimes numerous, simple, erect from a more or less curved ascending base, from yellowish-green to purplish, from smooth and shining to striate and granular-puberulent, 1–3 dm. high: leaves very variable, 2–5 cm. long or the lower much reduced, from linear-lanceolate, acuminate, entire to more broadly lanceolate to obtusish: upwardly becoming broadened at apex and toothed or cleft or with short lateral lobes, from glabrate-puberulent below to lanate-ciliate above: inflorescence at first short and dense, comparatively short even in fruit, gay or almost gaudy, the purple bracts large, lanate-ciliate, dilated upward, entire or 3-cleft, the middle lobe broadest, nearly equaling the flowers: calyx equally cleft to about the middle, the two lobes again cleft to about the middle into oblong-lanceolate lobes: corolla yellow and more or less streaked with purple on the lower side, 18–22 mm. long, galea about ½ as long as the tube, truncate and obscurely

toothed at the apex, the middle tooth the largest: the lip short, its three teeth acuminate and inflexed, only about ¼ as long as the galea: style exceeding the galea, stigma obscurely two-lobed: capsule ovate, 1 cm. long.

It seems probable that specimens of this occur in herbaria as *C. pallida septentrionalis* Gray, a species which, now that Mr. Greenman has cleared up some of the difficulties connected with the *C. pallida* group,* had best be written *C. acuminata* (Pursh) Spreng. Though this latter is undoubtedly an aggregate, so far as specimens are concerned as *C. pallida* had long been, and while I shall not at present attempt to state the limits and characters of that species, there is enough unanimity among the earlier authors to justify the separation of the species now proposed. The two may be distinguished by the very marked difference of color, by the character of the bracts and leaves and by their different geographical range. *C. lauta* is, so far as known to the writer, a species of the central Rockies, where it occurs on moist slopes at sub-alpine to alpine stations.

Type no. 6708, Dunraven Peak, Yellowstone Park, Aug. 29, 1899.

Porterella eximia

Perennial (?): stems simple, about 1 dm. high, semi-fleshy, ascending or erect, the short internodes each bearing a single leaf, continued below the surface of the soil as an ascending or horizontal rootstock with numerous whorled roots at the nodes: leaves linear, gradually long-acuminate from the dilated base, 15–25 mm. long, the uppermost (floral) broader, almost lanceolate: flowers few, singly in the axils of the crowded uppermost leaves: peduncles short, usually less than half as long as the subtending leaf: sepals foliaceous, broadly linear, 6–8 mm. long, obtusish, slightly exceeding the tube of the corolla: corolla a deep blue, bilabiate; the upper lip (apparently) of two oblong, erectish lobes about equaling the tube; the lower (apparently) of three obovte lobes longer than the tube, somewhat depressed, with two narrow yellow plicae in the throat: capsule obconical, many-seeded.

There is little doubt that Dr. Rydberg† is justified in reëstablishing this genus, represented hitherto by but one North American species, *P. carnosula* (Hook. & Arn.) Torr. described by Gray in

* Bot. Gaz. **25**: 265, 266. 1898.

† Mem. N. Y. Bot. Gar. **1**: 482. 1900.

Bot. Calif. **7**: 444 (under *Laurentia*) and by Torrey in Cat. Pl. Hayden Rep. 488, 1872. The flowers of the present species are unusually showy and handsome for the size of the plant. It was found in abundance on the muddy borders of shallow ponds near Jackson's Lake, Aug. 17, 1899.

Senecio perplexus

Rootstock very short, with numerous semi-fleshy roots; the single stem erect, rather stout, 2.5–5 dm. high, loosely arachnoid or floccose woolly when young as are also the leaves, becoming glabrate but usually some of the woolly or crinkeled hairs persisting, especially on the petioles, even at maturity, rather leafy below, *i. e.*, on the lower ⅓ of the stem: the lower leaves oblanceolate or broader or tapering uniformly to both ends, mostly obtuse, 5–10 cm. long, the margined petiole usually shorter than the blade; the middle leaves mostly sessile and narrower and becoming linear: the uppermost small and bract-like, all entire or at most remotely denticulate, sometimes with a slightly crisped margin: heads several (8–15), in a cymose corymb, 10–12 mm. high, the central peduncles very short, the lower or outermost elongating and often overtopping the others, the rays conspicuous, few (5–10); the involucral bracts linear, black-tipped, about 7 mm. long, scarcely thickened dorsally and with thin margins: akenes (mature) brownish, finely striate, glabrous, linear, equaling or longer than the fine soft pappus.

This species now proposed is a part of that Rocky Mountain aggregate long known as *S. lugens*. As has been shown by Dr. Greene (Pittonia **3**: 170) *S. lugens* proper belongs to the far north and *S. lugens* of Hooker's Flora is a very different plant of British Columbia and the northwestern United States. This Dr. Greene, *l. c.*, characterizes and names *S. Columbianus* but it has more recently appeared as *S. atriapiculatus*.* The Rocky Mountain plant differs materially from this northwestern ally as it does also from another of the far West to which it is sometimes referred, viz, *S. exaltatus* Nutt.

Recently Dr. Rydberg, *l. c.*, has published some related species but none of them are closely allied except *S. arachnoides* which is distinguished from this by the sinuate-dentate leaves, the more copious pubescence, the auricled stem leaves and the thick involucral bracts.

* Rydb. Mem. N. Y. Bot. Gard. 1: 442. 1900.

It occurs probably throughout the middle Rockies, occupying dry, open slopes at moderate elevations (1800–2500 m.). Numerous collections of it are at hand; the following are cited as representative: 128, 1305, 3139, 5569 and 5656, the first three from southern Wyoming and the last two from Yellowstone Park.

Senecio dispar

Rootstock almost wanting, merely a crown for the numerous fibrous or semi-fleshy roots: the single stem erect, only moderately stout, 5–8 dm. high, striate, appearing almost smooth and sometimes somewhat shining but sparsely pubescent with flat, crisped hairs: leaves very variable, thin, entire or obscurely repand-denticulate, the mid-nerve prominent, delicately reticulate-veined; the root leaves narrow, the blade proper oblong-lanceolate and borne on a margined petiole equaling or exceeding it; the lower stem leaves oblong-spatulate, tapering gradually into a broad petiole which is shorter than the blade, 8–10 cm. long (including the petiole), somewhat exceeding the root leaves; the middle stem leaves sessile by a broadish base, tapering gradually to the acute apex; the uppermost similar or often long-acuminate, gradually smaller and becoming bract-like, giving the upper part of the stem a scape-like appearance: heads few to many (5–20), campanulate, 10–14 mm. high, somewhat umbellately clustered or when more numerous with some additional peduncles from the axils of the uppermost bracts: the peduncles very unequal, the earliest short and stout, some of the later ones often 7–12 cm. long and bearing 2–4 heads: involucral bracts linear-lanceolate, minutely black-tipped, 7–8 mm. long: rays conspicuous, 6–10, 12–15 mm. long, about 3 mm. broad: akenes flattened, obscurely striate, linear-oblong, smooth or very minutely and sparsely scabro-puberulent, about 4 mm. long, mostly exceeded by the soft white pappus.

Most nearly allied to *S. integerrimus* Nutt. which is to be distinguished from this by its glabrous condition, its rather fleshy leaves, and the less evidently margined petioles. In that the inflorescence is also rather simply cymose-umbellate while in *S. dispar* some accessory peduncles arise in the uppermost axils.

Occurs in the open woods among the undershrub, along the streams. Laramie Hills, June 16, 1897, no. 3162; Green Top, June 29, 1897, no. 3232 (type); Yellowstone Park, July 10, 1899, no. 5754.

Artemisia aromatica

Perennial from a woody, much branched caudex; the whole plant dark green and nearly or quite glabrous from the first, heavily but rather pleasantly aromatic scented; the numerous stems tufted, mostly simple, sometimes sparingly branched from the base, more or less branched above in respect to the inflorescence, striate, from spreading ascending to nearly erect, 4–8 dm. high: leaves nearly all entire, some of the lower 3-cleft, narrowly to broadly linear, 1–several cm. long, numerous, many produced on short, slender, sterile, axillary shoots: inflorescence paniculate, leafy; the heads numerous, nodding on short slender pedicels, 3–4 mm. in diameter: involucre glabrous, the bracts oblong-elliptic, obtuse, dark green with scarious margins: flowers numerous, the fertile 10–20, the sterile hermaphrodite about twice as many.

This species is *A. dracunculoides* of Gray's Syn. Fl. and of Britt. & Br. Ill. Fl. in part both as to description and range. That it is distinct from *A. dracunculoides* Pursh seems to me clear. His description was drawn from that Mississippi Valley plant, which is much larger, freely branched, the branches drooping (ramis nutantibus) and the heads fewer flowered. Pursh, as does also Nuttall, cites *A. nutans* of Frazer's Catalogue as a synonym. That Pursh's plant is also the *A. cernua* of Nuttall is evident not only in the substantial agreement of the descriptions in regards to habit, branching and flowers, but the type localities is evidently nearly the same. That the species now proposed is distinct from the varieties given in T. & G. Fl. 416 is evident from the characterizations; those varieties are rather forms of the original of *A. dracunculoides*. This fact also disposes of *A. Nuttalliana* Bess. in Hook. Fl. Bor. Am., as that seems to be equivalent to variety *brevifolia* of the T. & G. Fl. which is there characterized by the shorter, more freely cleft leaves). *A. inodora* Hook. & Arn. Bot. Beechy is not known to me, but it would seem probable that it is distinct from all the before mentioned. The fact that Pursh does not mention the odor and that Nuttall says "neither aromatic nor agreeably scented" puts *A. dracunculoides* in sharp contrast with *A. aromatica*. This Rocky Mountain plant is, as stated before, strongly (in some plants almost overpoweringly) aromatic scented. This is apparent even in dried specimens but of course becomes

less apparent as they grow older so that in the herbarium they may finally be devoid of odor.

The range of this species, as represented by the material before me, is the north-central Rockies, but it probably is more widely distributed. Nos. of the past season may be cited as typical as follows: 6602, Yellowstone Lake; 6804, Henry's Lake, Idaho; 6903, Laramie Hills.

Artemisia nova

The shrubby base low, scraggy-branched, prostrate spreading, rarely 1–2 dm. high, with grayish, shreddy bark: the herbaceous stems (season's growth?) very numerous, fascicled, slender, simple, leafy below the inflorescence, 1–2 dm. high including the narrow spike-like panicle, grayish with a thin tomentum, or mere pubescence as also are the leaves: leaves very narrowly cuneate, 1–2 cm. long, 3-toothed at apex, the middle tooth usually longest: panicle leafy at base, naked above, strict and nearly simple: heads small, very numerous, only 3–4 mm. long, usually 3-flowered but often only one or two: involucral bracts closely imbricated, greenish, only slightly puberulent: akenes glabrous, resinous dots on the tube of the corolla only.

That this species has so long escaped detection can only be accounted for on the assumption that it was a depauperate form of the common sage-brush (*Artemisia tridentata*). That such was not the case has been a growing conviction with me for some time. A critical examination leaves no room for doubt. The impressions made in the field * that this is constantly a dwarf form with simple, slender, fascicled stems and greenish inflorescence, is confirmed by differences in floral characters. The few-flowered involucre and the differences in pubescence are conclusive and separate it also from *A. arbuscula*, from which it is equally well separated by its leaves. It occurs on hillsides and ridges either on the plains or in the foothills.

Collected as follows: 4095, Medicine Bow, Aug. 11, 1898; 5272, Centennial Valley, Aug. 30, 1898; 5334, Laramie, Sept. 14, 1898.

* Mr. Elias Nelson when collecting one of the numbers of this made the following field note: "Occurs on open hills and ridges, never in the draws but always in exposed places; very different from *A. tridentata* in habitat and general appearance, being greener in color and always a low shrub."

Notes and Descriptions of North American Plants.—II

By John K. Small

I. NOTEWORTHY SPECIES

Habenaria Garberi Porter, Bot. Gaz. **5**: 135. 1880

The original and second known stations for this interesting orchid are both near Manatee, Florida. A second locality can now be placed on record; this is Orange County, Florida, where Mr. F. L. Lewton discovered the species at several stations in the summer of 1894. His specimens are essentially the same as the type.

Habenaria macroceratitis Willd. Sp. Pl. **4**: 44. 1805

This remarkable tropical *Habenaria* has been found native in Florida, by Mr. Lewton. It is not rare in Sumter County, where he first met with it in 1894.

Thermopsis mollis (Michx.) M. A. Curtis, Mem. Am. Acad. II. **3**: 47. *pl. 9.* 1848

Heretofore this comparatively rare species has been reported as growing in the mountains of Virginia and North Carolina. But its range is wider than this; in May, 1869, Mr. Canby collected it on Lookout Mountain, Tennessee, and on May 21, 1890, Professor Scribner rediscovered it at the same locality.

Pluchea imbricata (Kearney) Nash, Bull. Torr. Club, **23**: 108. 1896

Excellent specimens of this *Pluchea* were collected in swamps about Forest City, Orange County, Florida, by Mr. F. L. Lewton in July, 1893. The specimens of this collection agree almost perfectly with the type.

Hieracium Scribneri Small, Bull. Torr. Club, **21**: 20. 1894

Professor Ruth has sent me almost typical specimens of this rare member of *Hieracium* from near Knoxville, Tennessee, where he collected the plant in 1897.

SENECIO MILLIFOLIUM T. & G. Fl. N. A. 2: 444. 1843

In 1887 Mr. E. R. Memminger rediscovered this rare *Senecio* in Henderson County, North Carolina, where it was collected many years ago by Buckley. In 1895 Mr. A. M. Huger sent me specimens from Macon and Jackson counties, North Carolina, where he found it growing plentifully on sloping cliffs at altitudes ranging from 1100–1400 meters.

II. HITHERTO UNDESCRIBED SPECIES

Allium arenicola

Bulbs nearly 1 cm. long, with fibrous outer coats. Leaves basal; blades very narrowly linear, becoming almost filiform, about as long as the scape or shorter: scapes erect, sometimes several together, 1–3 dm. tall, more or less curved: umbels erect, 10–30-flowered: pedicels 5–10 mm. long, slender: perianth deep pink; segments linear to narrowly linear-lanceolate, about 4 mm. long, very delicate: filaments dilated below: capsules not crested.

In sandy soil, Mississippi. Spring.

This species has been confused with *Allium mutabile* Michx. for nearly three quarters of a century. It is much more slender in habit and smaller in all its parts. The type specimens were collected by Martha B. Flint at Brookhaven, Mississippi, April 1, 1888.

Ranunculus cuneiformis

Foliage hirsute below the inflorescence. Roots thickened, clustered: stems usually several together, 2–3 dm. tall, erect or ascending, rather slender: leaves mainly basal; blades, at least some of them, twice-divided into cuneate rather obtuse segments, 5–10 cm. long, about as long as the petioles; upper stem leaves with blades 3-parted; segments narrow, often incised: flowers yellow, about 1.5 cm. broad, on strigillose peduncles: heads of fruit subglobose or ovoid-globose, about 1 cm. long: receptacle barely elongated: achenes 4 mm. long, conspicuously winged and with a triangular beak.

On prairies, near Kerrville, Texas. Spring. *Heller*, Pl. S. Tex. no. 1688. It differs from its relative as shown below:

RANUNCULUS CUNEIFORMIS

Blades of lower leaves twice-divided: corollas 1.5 cm. broad: heads of achenes subglobose or ovoid-globose, receptacle barely elongated: achenes conspicuously winged, with triangular beaks.

RANUNCULUS MACRANTHUS

Blades of lower leaves once-divided: corollas 3–5 cm. broad: heads of achenes oblong to cylindric: receptacle elongated: achenes narrowly margined, with subulate slightly curved beaks.

Ranunculus Mississippiensis

Perennial, stoloniferous, fleshy. Stems stout, about 2 dm. tall, more or less branched: leaves various; basal or those on the lower part of the stem with ovate or ovate-lanceolate sinuate-dentate blades 1.5–4 cm. long, and elongated petioles, upper leaves with oblong or linear remotely-toothed blades 3–8 cm. long: flowers few: sepals oblong to suborbicular, sparingly pubescent: corollas about 1.5 cm. broad; petals about 9, nearly oblong, deep yellow and lustrous within.

In low grounds, Arkansas and Mississippi. Spring.

ARKANSAS: Varner, Lincoln Co., April 28, 1898; *Bush*, no. 12.

MISSISSIPPI: "Alluvions." 1840; *Peck*.

Related to *Ranunculus oblongifolius*, but more robust, with truncate or cordate blades terminating the elongated petioles of the lower or basal leaves and much larger corollas consisting of about nine petals.

Thalictrum mirabile

Perennial, slender, glabrous, bright green. Stems erect, 1–3 dm. tall, wiry, dichotomously branched above: leaves various, basal usually ternately compound, with petioles about 2 cm. long; upper leaves gradually more simple and shorter petioled: leaflets suborbicular or orbicular-reniform, 2–3 cm. broad, very thin, delicately nerved, glaucescent beneath, broadly crenate or shallowly crenate-lobed, truncate or subcordate at the base, longer than the petiolules: peduncles hair-like: flowers white: sepals spatulate or rhombic-spatulate, fully 1.5 mm. long: filaments fully 2 mm. long, club-shaped by an abrupt thickening about the middle: fruit spreading at right-angles to the peduncle; body plump, about 2 mm. long, acute, not depressed along the upper side, as long as the filiform stalk or shorter.

Resembles *Thalictrum clavatum* but more delicate and smaller throughout, and with very short-petioled basal leaves. The fruit

is only about one-half the size of that of *T. clavatum* and has a plump barely ribbed body not at all depressed along the upper side.

The original specimens were collected by Prof. F. S. Earle under sandstone bluffs on Little Mountain near Moulton, Alabama, June 25, 1899, no. 2212.

Phyllanthus Avicularia

Perennial, bright green. Stems branched at the base and throughout, 3–6 dm. long, puberulent, striate in age: leaves numerous, ascending: blades oblong, or slightly broadest above the middle, 8–18 mm. long, blunt or barely pointed, slightly paler beneath than above, rounded or truncate at the base: petioles 1 mm. long, or shorter: calices short-pedicelled; staminate delicate, barely 2 mm. broad, sepals orbicular-obovate or suborbicular: pistillate firmer, fully 2 mm. broad or barely 3 mm. broad at maturity; sepals oblong or oval, scarious-margined, persistent: capsules spheroidal, 3 mm. broad.

In dry soil, along the Brazos River, Texas. Type from Columbia, Texas, collected by B. F. Bush, October 26, 1899, no. 263.

Related to *Phyllanthus polygonoides*, but much more robust in all its parts. The leaves, too, are of an oblong type. The capsules conspicuously surpass the mature pistillate calyx, whereas those of *P. polygonoides* are at least equaled by the mature sepals.

OEnothera nyctaginiifolia

Apparently annual or biennial, sparingly pubescent. Stems branched at the base, branches spreading or decumbent, 2–5 dm. long, more or less branched: leaves rather few; blades lanceolate to ovate-lanceolate, 2–5.5 cm. long, acute or slightly acuminate, often somewhat crisped and twisted, undulate, ciliate, cuneate or truncate at the base; petioles 2–6 mm. long, pale, margined: flowers axillary: hypanthium bristly and with very slender hairs, especially about the ovary; tubular portion about as long as the ovary: sepals linear-lanceolate, fully 1.5 cm. long, thin and delicate: capsules 4–5 cm. long, club-shaped by the sterile basal portion which is slightly shorter than the fertile portion, about 4 mm. thick: seeds 1.5 mm. long, reticulated.

In dry soil, Flagstaff, Arizona, September 5, 1894, *J. W. Toumey*.

More closely related to *OEnothera laciniata* than any other species. It differs in the larger flowers and the club-shaped capsules, besides the conspicuous character of the leaves. These members are very suggestive of the leaves of *Nyctaginea* or the broad-leaved species of *Allionia*.

Phlox Brittonii

Perennial, deep green. Stems copiously branched; branched matted, forming wide tufts, glandular-pilose: leaves numerous, small ones often clustered in the axils of the larger; blades subulate or narrowly linear-subulate, 5–10 mm. long, ciliate, especially near the base: calices 5–6 mm. long, glandular-pubescent like the branches; segments subulate, about as long as the tube: corolla white: tube curved, about 1 cm. long; limb 12–13 mm. wide; segments cuneate, with 2 pale magenta spots near the base, cleft by a V-shaped sinus about 3 mm. deep, usually with a minute tooth in each sinus, tips acute or acutish.

On dry mountain slopes, Virginia and West Virginia to North Carolina. Spring and Summer.

A relative of *Phlox subulata* but more delicate in all its parts. The contrasting characters may be shown as follows:

PHLOX BRITTONII	PHLOX SUBULATA
Stems or branches glandular-pilose: leaf blades mostly 5–10 mm. long: calices 5–6 mm. long: limb of corolla less than 14 mm. broad; lobes usually with a minute tooth in each sinus.	Stems or branches not glandular: leaf-blades mostly 10–15 mm. long: calices 8–9 mm. long: limb of corolla over 15 mm. broad; lobes usually with toothless sinuses.

The specimens upon which the species is based were collected by Dr. N. L. Britton, at White Sulphur Springs, West Virginia, May, 1898. Dr. Britton then introduced the species in the herbaceous grounds of the New York Botanical Garden where the plants have become thoroughly established.

Vernonia interior

Perennial, finely and usually closely pubescent. Stems erect or ascending, 1–2 meters tall, simple below the inflorescence: leaves numerous; blades elliptic to elliptic-lanceolate, 6–20 cm. long, acuminate, sharply and rather finely serrate, sessile or nearly so: heads numerous, rather crowded: involucres campanulate, 6–7 mm. high, 4–5 mm. broad: bracts pubescent, sometimes hoary, acute or with short keel-like acuminations, the tips erect or slightly spreading: achenes pubescent: pappus purple.

On plains or prairies, Missouri and Kansas south to Texas. Spring to fall.

The species just described has heretofore been confused with *Vernonia Baldwinii* and *V. Drummondii*. It is readily separable from its nearest relative, *Vernonia Baldwinii* by the smaller involucres and their bracts which have erect or barely spreading tips. The following cited specimens belong here:

MISSOURI: Jackson County, *Bush*, no. 233A; McDonald County, *Bush*, no. 232.

NEBRASKA: Lincoln, *Webber*, September, 1888.

TEXAS: Kerrville, *Heller*, Pl. S. Tex. no. 1927.

This species has been raised from seed in the nurseries of the New York Botanical Garden and is now established in the herbaceous grounds.

Vernonia maxima

Foliage glabrous or sparingly pubescent. Stems erect, 1–3 meters tall, branching above: leaves rather numerous: blades narrowly elliptic to lanceolate or linear-lanceolate, 1–3 dm. long, acuminate, sharply serrate, narrowed into short petioles or the upper ones nearly sessile: corymbs 1–4 dm. broad: peduncles angled, barely enlarged upward: involucres hemispheric, 4 mm. to nearly 5 mm. high, rounded at the base: bracts ovate to oblong, acute to mucronate, ciliate, appressed: achenes 3 mm. long, upwardly barbed on the ribs: pappus light or deep purple.

In low ground, Ohio to Missouri, south to Alabama and Louisiana. Summer and fall.

For many years *Vernonia gigantea* or *V. altissima* has been an aggregate. The campestrian plant that has been known under both of those names is very distinct from the Carolinian and Floridian plant to which both the above cited names were originally applied.

The campestrian plant may easily be separated from the southeastern species by the lower involucres with rounded bases and their proportionately broader appressed and compactly arranged bracts. The involucres of the related species are narrowed at the base and have narrower loosely spreading bracts. The following cited specimens belong here:

MISSOURI: Jackson County, *Bush*, no. 230.

OHIO: no locality, *Riddell*, 1834. Scioto, *Merriam*, September 28, 1891.

WEST VIRGINIA: Monongalia County, *Millspaugh*, no. 677.

KENTUCKY: no locality, *Short*, 1842. Harlan County, *Kearney*, no. 188.

TENNESSEE: Knoxville, *Ruth*, September, 1894.
MISSISSIPPI: Agricultural College, *Pollard*, no. 1267.

Lacinaria Halei

Perennial, glabrous or nearly so. Stems erect, 6–9 dm. tall, simple or sparingly branched: leaves various; lower with linear blades 1–2 dm. long, upper narrowly linear and much shorter, not ciliate near the base: heads short-peduncled or nearly sessile, not densely crowded: involucres becoming narrowly turbinate, 7–9 mm. high: bracts lanceolate to oblong-lanceolate, acuminate, ciliolate, rigid: pappus plumose: achenes closely pubescent.

On prairies, Louisiana. Summer.

This species has heretofore been included in *Lacinaria acidota*, with which it has little or nothing in common, and it may be separated by its fewer leaves and much smaller heads which are disposed in elongated interrupted spikes. The bracts of the involucre are much shorter than those of *L. acidota* and have less elongated tips.

The species is founded on Hale's no. 334.

Lacinaria platylepis

Perennial, bright green. Stems erect, 8–9 dm. tall, simple, glabrate below, pubescent with white hairs above: leaves not very numerous, narrowly linear, 2–10 cm. long, or longer at the base of the stem, glabrous or nearly so: heads rather approximate, sessile, surpassing the subtending bracts: involucres cylindric-campanulate, 7–9 mm. long; outer bracts often ovate, acute, inner larger and broader, broadest above the middle, rounded at the apex, ciliolate: pappus not plumose, pale.

In sandy soil, Louisiana.

Plants belonging here have been referred to *Lacinaria acidota*. although none of the several characters warrant such a disposition, The fewer and shorter leaves, the elongated more or less interrupted spikes and smaller heads and involucres with their broad rounded inner bracts, are some of the characters that separate *Lacinaria platylepis* from *L. acidota*. The pappus too is not plumose.

The original specimens were collected in Louisiana by Dr. Hale.

New Species of Fungi*

By Flora W. Patterson

Hendersonia oleae

Forming large marginal pallid patches, with brown border: perithecia black, membranous, immersed, amphigenous, globose, 100–150 μ: conidia light olivaceous, oblong-elliptical, with subacute ends, 3-septate, not constricted, straight or slightly curved, 10 × 3.5 μ.

On leaves of *Olea dioica*, Botanic Garden, Sydney, New South Wales, April, 1898, J. H. Maiden.

Leptothyrium nitidum

Not forming spots: perithecia superficial, densely gregarious, sometimes confluent, elliptical-dimidiate, black, shining, astomate, occasionally longitudinally striate, context radiately cellular: conidia cylindrical, straight or slightly curved, hyaline, 2.5–3 × 1 μ: sterigmata 6 × 2 μ, arising from a compact layer of hyaline, rectangular cells, which are filled with large guttulae.

On dry stems of *Heracleum lanatum*, Longpine, Nebraska, February 24, 1898, J. M. Bates, no. 769.

Gloeosporium cassiae

Spots alutaceous, irregular in outline, with a raised brown border: acervuli amphigenous, scattered throughout the spots, raising the epidermis in a pustuliform manner, then erumpent: conidia ovate, pointed at one end, straight or slightly inequilateral, 4–6 × 1.5–2 μ: basidia hyaline, continuous, 15 × 1.5 μ.

On living leaves of *Cinnamomum cassia*, greenhouse, U. S. Department of Agriculture, January, 1900, F. W. P.

Gloeosporium clausenae

Spots large, irregular, subochraceous, with wavy, darker border on the margin of the leaves, most especially involving the tips: acervuli generally epiphyllous, very numerous, at first covered by the epidermis, subochraceous, erumpent: conidia ovate-oblong,

* Type specimens of these species are in the herbarium of the Division of Vegetable Physiology and Pathology, U. S. Department of Agriculture.

often inequilateral: ends obtuse or rounded, 15–17 × 5–6 μ: basidia filiform, hyaline, shorter than the conidia.

On living leaves of *Clausena wampi*, greenhouse, Department of Agriculture, January, 1900, F. W. P.

Gloeosporium ochraceum

Causing large arid spots of irregular shape, especially upon the ends of the leaves, alutaceous, with a dark brown border: acervuli amphigenous, raising the epidermis in dark pustules becoming erumpent: conidia ochraceous in the mass, ovate, somewhat pointed at one end, guttulate, 12–15 × 4–5 μ: basidia hyaline, 9–12 × 3 μ.

On living leaves of *Cinnamomum aromaticum*, greenhouse, Department of Agriculture, January, 1900, F. W. P.

It will be observed that while the general appearance produced by the presence of *Gloeosporium ochraceum* on *Cinnamomum aromaticum* is very similar to that of *Gloeosporium cassiae* on *Cinnamomum cassia*, they differ widely in microscopic details.

Gloeosporium oleae

Spots white, arid, with an inconspicuous brown border, large, sometimes occupying about one-fifth of the leaf's surface: acervuli epiphyllous, numerous, long, covered by the epidermis, erumpent, dark, almost black: conidia oblong or ovate-oblong, sometimes slightly inequilateral, often bi-guttulate, 9–15 × 4–5 μ.

On living leaves of *Olea fragrans*, greenhouse, Department of Agriculture, January, 1900, F. W. P.

Colletotrichum setosum

Spots large, irregular, arid, yellowish-white, with purple border: acervuli amphigenous, not erumpent, numerous, minute, 25–45 μ diameter: setae very dark brown, septate, slightly flexuous, obtuse, with somewhat enlarged base, 30–45 × 4 μ: conidia oblong, with rounded ends, 15–17 × 4–5 μ.

On *Tillandsia* sp., greenhouse, U. S. Department of Agriculture, received 1899 from Costa Rica, C. Werckle.

Libertella olivacea

Acervuli densely gregarious, subcutaneous, at length erumpent, sub-conical, .5–1 mm. diameter, olivaceous: conidia hyaline, filiform, curved, 5–6 × 1 μ: basidia filiform, 10–12 × 1 μ.

On dead branches of *Rhus glabra*, Ainsworth, Nebr., May 14, 1898, J. M. Bates, no. 814.

Aspergillus umbrinus

Sterile hyphae creeping, branched, septate, hyaline, fertile hyphae erect, simple, septate, hyaline or slightly colored, 150–300 × 6–8 μ, apex inflated, sub-globose, 15–24 μ, generally 18 μ: sterigmata club-shaped, 12 × 6 μ: conidia in chains, bright umber colored, verrucose, 6–9 μ diameter.

The description is for the typical form from which there are extreme variations. Fertile hyphae may be only 18 μ in length, having an apex but slightly and irregularly enlarged, which may bear but 3–6 sterigmata, which are sometimes flask-shaped, 9–18 × 6–8 μ, and occasionally septate. When cultivated upon sterilized potato the species grows with great luxuriance. Measurements of conidia and hyphae remain practically the same, but the vesiculose portion is more nearly spherical and ranges from 30–45 μ in diameter, with sterigmata averaging 15 μ.

Upon such cultures in about five weeks there have developed numerous snow-white sclerotia, 1–5 mm. in height and 1–3 mm. in breadth.

In Brazil nut, Washington, D. C., February, 1900, E. A. Bessey.

Sterigmatocystis castanea

Thinly effused: fertile hyphae erect, simple, continuous, hyaline, 400–550 × 12 μ: apex inflated to a spherical head, 30–40 μ, from which radiate clavulate basidia 16 μ in length: sterigmata 4, 6–7 × 2 μ: conidia in chains of 4 or 5, spherical, verrucose, brown, 4–5 μ.

On *Persoonia lanceolata*, New South Wales, March, 1898, J. H. Maiden.

Cladosporium aeruginosum

Tufts epiphyllous, verdigris green, densely fasciculate, distinct, upon light-colored arid spots: hyphae simple, septate, nodulose, very light green, 45–90 × 3–3.5 μ: conidia lateral and terminal, in chains of 5 or more, almost hyaline, generally oblong and continuous, sometimes oblong-elliptical and once or twice septate, 5–12 × 2–2.5 μ.

On living leaves of *Olea fragrans* affected by *Gloeosporium oleae*, greenhouse, Department of Agriculture, January, 1900, F. W. P.

Cladosporium fici

Not forming spots: tufts conspicuous, aggregated, sometimes confluent, olive green: hyphae long, erect, slightly wavy, very rarely branched, septate, 45–250×4 μ: conidia light olive, terminal and lateral, more especially borne near the tips of the hyphae, oblong continuous ones 6–9×4 μ, sometimes in chains of 4, those 1–3 septate, oblong-elliptical to cylindrical, 9–25×4–5 μ, somewhat thickened at the septa and the longer ones often equilateral.

On living leaves of *Ficus parcelli*, greenhouse, Department of Agriculture, January, 1900, F. W. P.

Helminthosporium solitarium

Sterile hyphae inconspicuous, generally subepidermal: fertile hyphae, but slightly fasciculate, often solitary, erect, dark sooty brown, septate, swollen at the base, the upper portion (about ⅓, upon which the spores are borne) wavy or twisted, usually lighter colored at the apex, 60–150 × 6 μ; conidia dark brown, at first 2–4-guttulate, then 3–5-septate, oblong-elliptical, sometimes slightly curved, 24–30 × 8–9 μ.

On leaves of *Iris* sp. affected with *Fusarium iridis* Oud., Minneapolis, Minn., October, 1898, J. M. Bates, no. 928.

Heterosporium oxybaphi

Sterile hyphae subcuticular: fertile hyphae erect, densely fasciculate, fuscous olivaceous, simple, septate, coarsely nodulose, 90–125 × 6–7 μ: conidia in short chains soon falling apart, fuscous-olivaceous, epispore echinulate, elliptical or ovoid, 1–2- rarely 3-septate, seldom constricted at the septa, 18–27 × 9–12 μ.

On dead stems of *Oxybaphus angustifolius*, Longpine, Nebraska, June 24, 1898, J. M. Bates, no. 821.

Stemphylium butyri

Hyphae decumbent, long, wavy, grayish black, closely septate, 3–4 μ in diameter: fertile branches often very short: conidia darker than hyphae, verrucose, constricted at the septa, very irregular in shape, sometimes almost spherical, generally elliptical or sub-pyriform, borne at the tip or sides of the branches, sometimes two or three connate and in clusters, 18–36 × 9–18 μ.

Butter affected with this fungus assumes a bluish-black color in isolated spots, and these gradually extend over the entire surface. The specific description is written from an examination of butter sent to the Division of Vegetable Physiology and Pathology

from the Agricultural Experiment Station of Oregon, by D. W. Trine, and from cultures of the same made upon agar-agar. Mr. A. F. Woods reports having seen the same species, which he recognized as a new one, in butter from South Carolina and other localities.

Stemphylium elasticae

Effused, grayish-black, decumbent, intricately branched, closely septate, 3–3.5 μ in diameter: conidia borne in chains of 2–6 at or near the tips of the fertile branches, not soon falling apart: verrucose, muriformly many-septate, constricted at the septa, darker than the hyphae, irregular in shape, ovate and somewhat pyriform or cylindrical, 18–45 × 9–18 μ, isthmus cell almost hyaline, 2–3 μ.

On parts of leaves of *Ficus elastica* attacked by *Gloeosporium elasticae* Cke. and Mass., Washington, D. C., January, 1900, F. W. P.

Volutella allii

Sporodochia black, sessile, convex, elongated, 100–150 μ in diameter, gregarious and sometimes confluent, densely covered with rigid black setae that are smooth with pointed tips and are 60–175 × 6 μ; conidia fusiform-falcate, hyaline, 18–21 × 3–4 μ; conidiophores densely crowded, unbranched, hyaline or slightly olive tinged, 18–20 × 3 μ.

On scapes of *Allium Nuttallii*, Atkinson, Neb., June 22, 1898, J. M. Bates, no. 820.

DIVISION VEGETABLE PHYSIOLOGY AND PATHOLOGY,
U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

Variations in the Maturing of Plowrightia morbosa Spores

By Wm. A. Riley

During the course of some work upon the black knot fungus, I was interested in noting the time of maturing of its ascospores, in the neighborhood of Ithaca. Between the actual date for this locality and the time which has been recorded for the New England and Middle States there is a decided discrepancy.

The first statements bearing upon this are those of Prof. C. H. Peck.* He notes that, "in specimens collected January 13th, spores were found in a few of the sacs but most of them were yet filled with their greenish contents." He states that he found spores as late as June.

Dr. W. G. Farlow † first found a few ripe spores on the 17th of January, and in the second week of February, most of the knots examined contained ripe spores. He found that late in the spring they were not so abundant or in such good condition. Dr. Humphrey,‡ who studied the fungus in the vicinity of Amherst, confirms Dr. Farlow's dates.

My observations commenced early in February of last year. On the 12th of that month I examined a large number of specimens and failed to find a trace of spores. My interest being aroused, I made throughout the term, two or more observations per week, usually examining a large number of knots from several different trees.

Not until March 7, after a week of mild weather, did I find a single ascus containing fully formed spores. March 22 specimens found on young shoots, where they had been protected and kept moist by snow, showed in the majority of the asci fully formed spores. Knots taken from the branches of the same tree showed that in most of the asci the spores were, at best, but faintly outlined. In only a very few asci were they nearly mature. By the middle of April the mature spores were fairly abundant but a

* Trans. Albany Inst. 7 : 199. 1872.

† Bull. Bussey Inst., 442. 1876.

‡ Rep. Mass. Agr. Exp. Sta. 8 : 206. 1890.

thorough examination as late as May 9 showed that fully three fourths of the spores were immature.

The possibility of exceptional exposure of the knots examined is precluded by the fact that I had under observation a number of trees, growing in diverse situations. It occurred to me that the winter might have been an unusually severe one. On this point, fortunately, the records of the weather station, located here, furnish reliable data. Until January, the winter was mild. Considering as normal the mean temperature for twenty years, the average for the months of January and February, 1899, was two and seven tenths degrees below the normal. On the other hand, the mean temperature for March was slightly above while that for April was four and two tenths degrees above normal. Moreover, "It's a poor rule which will not work both ways"; the present winter has been an unusually mild one. The mean temperature for January was three degrees above the normal. So far, the temperature this month has been unusually mild. Yet, up to the present (Feb. 17), I have found no fully outlined spores. That exceptional weather may affect the maturation of the spores is undoubted. It is, however, evident that, for this locality, the ascospores of *Plowrightia morbosa* normally mature considerably later than the time recorded by Dr. Farlow and others.

I find that a similar instance of slow development in the vicinity of Ann Arbor has been reported by A. A. Crozier.*

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

* Botanical Gazette, 10: 368. 1885.

Darluca upon Carnation Rust.—A preliminary Note

By Frederick H. Blodgett

On December 28 last, while examining a commercial carnation house, specimens of diseased leaves were secured which when examined carefully revealed the presence of the rust (*Uromyces caryophyllinus* Schr.) parasitized with *Darluca filum* Carst. Since that time the *Darluca* has been found in considerable abundance on a number of varieties of carnations.

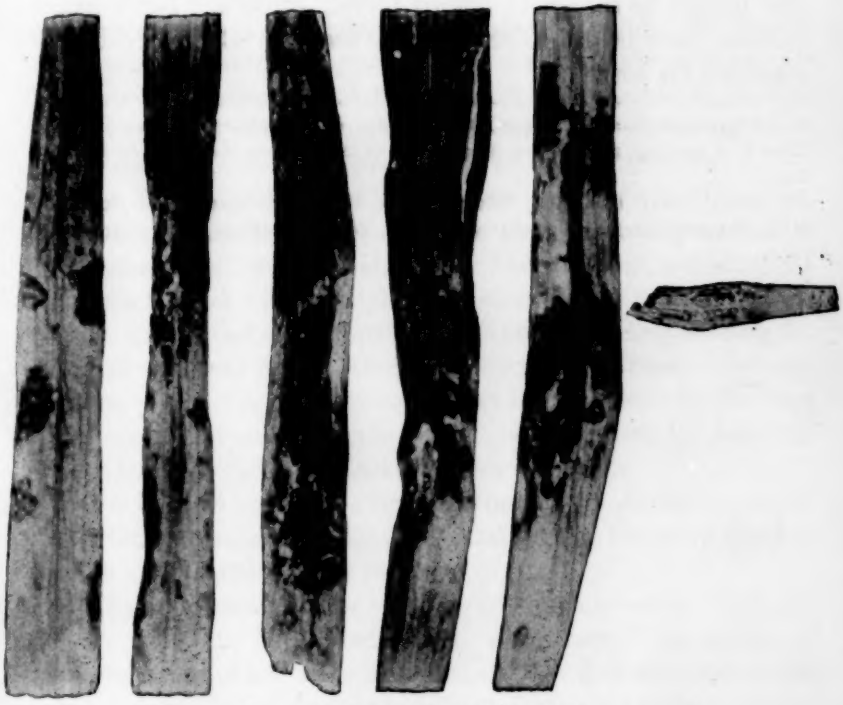

Fig. 1. *Darluca* on Carnation rust × 2.

On dark flowered kinds there is often present a dark colored area, blue- or red-purple in color, which is associated at times with the *Darluca*, but not a regular accompaniment of it. The more frequent appearance is of a dark area, very irregular in outline, but

extending some little distance along the leaf. A few pustules of the rust are usually present upon this area, and such are infested as a rule, by the pycnidia of *Darluca*. Occasionally pustules show the pycnidia when examined carefully, when there is no external evidence of their presence. Upon dead leaves, or dead areas at least, the *Darluca* appears in rare instances as very fine black specks, with no rust pustule closely associated with them.

It is of interest to note that while no mention seems to have been made of the fact, the *Darluca* was parasitic upon this rust as early as 1893,* two years after the rust appeared. It may be that the decrease in seriousness of the rust during the past few years is due in part to the check offered by the *Darluca*. But resistant varieties have helped to diminish the fear with which florists first regarded the rust.†

* Seymour & Earle, Economic Fungi, no. 460; *U. caryophyllinus* collected 1895 by Clara E. Cummings, at Wellesley, Mass. Part of the specimen shows the *Darluca* distinctly.

† C. F. Baker, Ft. Collins, Colorado, June, 1893.—The specimen in Herbarium N. Y. Botanical Garden shows *Darluca* no. 59, *Uromyces caryophyllinus* Schrank.

Proceedings of the Club

WEDNESDAY EVENING, FEBRUARY 28, 1900

Vice-President Allen was in the chair; thirty-two persons were present.

The Secretary announced the offer of the annual grant of $50.00 from the Newberry Fund, open to candidates from the Scientific Alliance in Botany or Geology. Dr. Britton spoke relative to the coming meeting of the A. A. A. S. in New York. He suggested that it might be well instead of our usual Fourth of July excursion to provide an excursion to the Pine Barrens, which would follow the A. A. A. S. meeting, which closes June 30. The Torrey Club might provide during such an excursion for the personal expenses of such members of the A. A. A. S. as should be invited. A committee of five was appointed to secure contributions, select the personnel of the excursion and make all arrangements.

Dr. Britton read a letter from Miss Julia G. Noll, of 309 La Grande ave., Plainfield, N. J., inviting the Club to take one of its May excursions to Plainfield, N. J. The invitation was accepted with thanks and referred to the Field Committee.

Dr. Allen read a letter to the Club from Mrs. Allen, inviting the Club to visit their home, Hazelwood, Conn., as a Torrey Club excursion. The hospitable invitation was accepted with thanks, as a Decoration Day excursion; to leave New York Tuesday, May 29, and referred to the Field Committee for action.

Dr. Britton reported that on February 9, *Helleborus niger*, the Christmas rose, expanded its petals at the Botanical Garden, and is still flowering under hay.

The first subject on the scientific programme was a "Note on *Apeiba*" by Dr. D. T. MacDougal, who showed specimens of leafy branches of this Tiliaceous tree, exhibiting flowers apparently seated on the leaves, an accidental but frequently quite stable position, due to abundant blossoms dropping from above, piercing lower leaves and lodging there. Dr. MacDougal witnessed this peculiarity in trees cultivated in Jamaica, originally from British Guiana.

The principal paper of the evening was a discussion by Dr. N.

L. Britton "On the Flowering Plants collected by Mr. R. S. Williams in the Yukon Territory, 1898–1899." Dr. Britton exhibited the plants collected, and by means of a sketch map of the region he compared the diverse floras of the Alaskan region.

TUESDAY EVENING, MARCH 13, 1900

President Brown in the chair; twenty-six persons were present.

The paper of the evening was by Dr. P. A. Rydberg, on the "Phytogeography of Montana." He divided Montana into three regions, the Great Plains, constituting about one half of the State, and the subalpine and the alpine regions, the last constituting those isolated peaks which exceed 9000 feet. The characteristic plant-coverings of each region, termed formations, were classed under the usual groups as Xerophytic, Mesophytic, Hydrophytic and Halophytic and include, as Xerophytes:

1. The Buffalo-grass formation, the chief Xerophytic formation of the Great Plains, where high, dry plains are covered with low self-curing grasses giving excellent winter pasture; including *Bouteloua oligostachya*, *B. hirsuta*, *Buchloe dactyloides*, and *Carex filifolia*.

2. The Cactus formation, with *Opuntia polyacantha*, *O. humifusa*, *Cactus viviparus*, *C. Missouriensis*, and *Lepidium apetalum*.

3. The Sage-brush formation, with *Artemisia tridentata*, *A. cana*, *A. tripartita*, *A. arbuscula*, together with species of *Chrysothamnus*, *Eurota*, and *Tetradynia*.

4. Bad-land formation, species of *Eriogonum* and *Astragalus*.

5. Pine-ridge formation, with *Pinus scopulorum* and *Juniperus occidentalis*.

Mesophytic formations of the Great Plains.

The Prairie formation, the most important, forming the grasslands in the river-valleys, its species belonging to the prairie region, and include species of *Agropyron*, *Elymus*, *Andropogon* and *Poa*.

7. The Dog-town formation; four plants are found in all prairie-dog towns: *Chenopodium incanum*, *Solanum triflorum*, *Cryptanthe crassisepala* and *Munroa squarrosa*.

8. The Sand-draw formation, with *Cleome trachysperma* and species of *Euphorbia*. In this connection were mentioned the weeds of the region, *Helianthus annuus*, *Chenopodium album* and *Avena fatua*, all introduced, and *Helianthus petiolaris*, *Chenopodium*

leptophyllum, Eriocoma cuspidata, Phacelia linearis, Lygodesmia juncea, natives.

Hydrophytic formations of the Great Plains include :

9. The Wet-meadows, covered with grasses and sedges, with species of *Calamagrostis, Poa, Agrostis, Spartina* and *Alopecurus.*

10. The Sand-bar formation, with *Salix fluviatilis* and *Shepherdia argentea.*

11. Purely aquatic plants, species of *Lemna, Potamogeton, Batrachium* and *Nymphaea.*

Halophytic formations of the Great Plains include :

12. Salt-marsh formation, with *Spartina gracilis*, and two species of *Triglochin.*

13. The Alkali-flat formation, with *Agropyron Smithii*, and several Chenopodiaceous plants, as *Atriplex, Sarcobatus, Dondia*, etc.

Subalpine formations follow : first, the Xerophytes :

14. The Grass-covered Foothills and Bench lands ; with *Festuca ovina, Agropyrum spicatum, Elymus condensatus*, and *Avena Americana.*

15. Rock-crest formation, with species of *Heuchera* and *Erigeron ;* and with the Bitter-root, *Lewisia rediviva*, the Montana state flower.

Mesophytic subalpine formations are :

16. The Poophytic, covering the drier valleys and grassy hillsides ; the same grasses as in the drier foothills, with addition of more valuable species, especially of *Poa*, as *P. Nevadensis, P. Buckleyana* and *P. lucida.*

17. The Hylophytic or Forest formation, the covering of wooded mountain-sides and pine flats ; all conifers, as *Pinus Murrayana, P. flexilis, P. albicaulis, Picea Engelmanni, P. Columbiana, Abies grandis, A. amabilis, Pseudotsuga mucronata ;* besides which occur along streams, *Alnus tenuifolia, A. sinuata, Betula occidentalis, B. glandulosa* and several species of *Salix.*

18. The chief Hydrophytic subalpine formation, that of the wet mountain-meadows, luxuriant in grasses and sedges. The most valuable hay plants there are *Phleum alpinum* (nearly related to the cultivated timothy), *Alopecurus occidentalis*, a foxtail grass, and two clovers, *Trifolium Beckwithii*, and *T. Rydbergii.*

The water plants of the mountain region are practically the same in the plains ; as are the halophytes.

There are also:

19. A Mountain-bog formation, with several species of *Phyllodoce, Kalmia microphylla, Ledum glandulosum* and *Salix chlorophylla.*

20. The Geyser formation peculiar to geyser and thermal waters are *Spraguea multiceps, Panicum thermale, Mentha rubella* and *Eleocharis thermale;* the latter growing in water hot enough to be unpleasant to the touch.

In the alpine region the differentiation into xerophytic, mesophytic and hydrophytic formations is less marked; halophytes are wanting, and the hylophytes are stunted specimens of *Pinus albicaulis* and *Abies subalpina.*

The peculiar alpine formations are:

21. Alpine clover-fields, with species of *Trifolium* only a few centimeters high, as *T. nanum, T. montanum, T. dasyphyllum,* and *T. Haydeni.*

22. The Alpine-willow formation, made up of *Salix nivalis S. petrophila, S. tenera, S. glaucopis,* and *S. Dodgeana,* the last one the smallest willow in the world, no specimen being two inches high. It was discovered on Electric Peak in the north border of the Yellowstone Park, at an altitude of 3300 m., and was named in honor of Mr. Wm. E. Dodge, of New York, through whose liberality this botanical exploration was prosecuted.

23. Finally the Rock-slide formation, with curious flora, consisting of *Claytonia megarrhiza, Alsine Americana, Arenaria Nuttallii* and *Gilia debilis.*

Dr. Rydberg's paper was followed by remarks by Judge Brown on the beauty of the mountain flora, and by Dr. Britton on the Dodge expedition of 1897, of which the paper is a result.

Professor Britton announced that the keys of the Museum building of the New York Botanical Garden had been turned over to him, and that the museums were immediately opened to the public. The installation of the temporary exhibit is going rapidly forward. President Brown added that the Torrey Club congratulates itself on the progress of the Botanical Garden, progress which is in large part the outcome of the Club's influence.

Adjournment followed.

EDWARD S. BURGESS,
Secretary.

Index to recent Literature relating to American Botany

This Index is intended to include (1) Titles of all papers and books relating to American plants; (2) All papers on botanical subjects by American botanists; (3) Papers of special interest relating to physiological or morphological subjects wherever published. Botanists can aid greatly in this matter by the contribution of separates of their papers especially those published outside the usual botanical journals, such as the publications of learned societies, experiment station bulletins and reports, and journals only occasionally containing botanical matter.

The titles are reprinted monthly on standard library cards of two widths, and are sold to subscribers at the price of one cent per card.

The editors will welcome any notice of omitted titles or other suggestions relative to the greater efficiency of the Index. Address all matter relating to the Index to The Torrey Botanical Club, Columbia University, New York City.

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